ST012 Remedial Action
Field Variance Memorandum 5 – Extraction and Treatment System Construction

Date: 30 September 2016

From: Amec Foster Wheeler Environment & Infrastructure, Inc.

To: Catherine Jerrard (AFCEC)

Cc: Geoff Watkin (CNTS)

Subject: **Proposed Active Containment**
Former Liquid Fuels Storage Area (ST012)
Former Williams Air Force Base – Mesa, Arizona

1.0 INTRODUCTION

This Field Variance Memorandum (Memo), prepared as a variance to Draft Final Addendum 2 to the Remedial Design and Remedial Action Work Plan (RD/RAWP) (Addendum 2) (Amec Foster Wheeler, 2016) describes construction and operation activities for the Addendum 2 groundwater extraction and treatment system at the Former Liquid Fuels Storage Area (ST012) at the former Williams Air Force Base. The groundwater extraction and treatment system will provide active containment for the dissolved phase contaminant plume pending results of further LNAPL and dissolved phase plume characterization being addressed under ST012-RA-FVM-4. This Memo details the following components of the on-site groundwater extraction and treatment system:

- the groundwater extraction and treatment process;
- installation of the groundwater extraction treatment equipment;
- the extraction and monitoring well locations; and
- the proposed schedule for the construction and operation of the active containment system.

2.0 OBJECTIVES

The objective for the construction and operation of the Addendum 2 groundwater extraction and treatment system is to provide containment for the dissolved-phase contaminant plume using the existing groundwater extraction and monitoring well network. This Memo describes the construction and operation of the groundwater extraction system as a modification to the construction and operation plans previously documented in Addendum 2 (Amec Foster Wheeler, 2016). Specifically, this FVM addresses initial construction of the Addendum 2 groundwater extraction and treatment system (not the EBR injection system) pending results of further LNAPL and dissolved phase plume characterization being addressed under ST012-RA-FVM-4.

3.0 SCOPE OF WORK

This Scope of Work provides the framework for construction and operation of the groundwater extraction and treatment system (GWETS) specified in Addendum 2. The GWETS will consist of the following unit processes plumbed together with interconnecting piping (see process flow diagram in **Attachment 1**, Figure 3-1 from Addendum 2):

1. Groundwater extraction well and pump network consisting of 22 wells, equipped with variable frequency drive (VFD)-controlled submersible pumps
2. Equalization tank
3. Particulate bag filtration
4. Chemical addition; two locations, prior to particulate bag filtration and prior to air stripping
5. Gravity separation
6. Air stripping; and
7. Granular activated carbon (GAC) filtration.
8. Discharge to City of Mesa sewer

3.1 Groundwater Extraction Well and Pump Network

The groundwater extraction well and pump network for the active containment system is the same system detailed in Sections 3.2.2 and 4.1.2 of Addendum 2 updated for as built well conditions, specifics on the well pumps, and a description of considerations for handling LNAPL in wells. The groundwater extraction well and pump network for the active containment system consists of 22 wells, split across the cobble zone, upper water bearing zone, and lower saturated zone. Figures 3-2, 3-3, and 3-4 updated from Addendum 2 and included in **Attachment 1** show the well locations for the extraction and monitoring wells in each of these zones. Table 3-1 shows the existing well inventory that will be used for groundwater extraction, provides the screened interval, and remedial action phase in which it was installed (e.g., steam enhanced extraction [SEE] or post-SEE Phase 1). **Attachment 2** includes the well construction logs for the wells in the extraction well inventory in Table 3-1.

Table 3-1 Extraction Well Inventory

(Extraction wells combined from Addendum 2 Tables 4-1 and 4-2; screened intervals for post-SEE wells updated based on completions)

Well Identification[1]	Phase Installed	Screened Interval (ft bgs)
ST012-CZ18	SEE	145 - 160
ST012-CZ19	SEE	145 - 160
ST012-CZ21	Post-SEE Phase 1	140 - 150

Table 3-1 Extraction Well Inventory

(Extraction wells combined from Addendum 2 Tables 4-1 and 4-2; screened intervals for post-SEE wells updated based on completions)

Well Identification[1]	Phase Installed	Screened Interval (ft bgs)
ST012-UWBZ10	SEE	170 - 195
ST012-UWBZ22	SEE	170 - 195
ST012-UWBZ26	SEE	170 - 195
ST012-UWBZ27	SEE	170 - 195
ST012-UWBZ30	Post-SEE Phase 1	171 – 191
ST012-UWBZ31	Post-SEE Phase 1	170 – 190
ST012-LSZ09	SEE	205.5 - 240.5
ST012-LSZ11	SEE	206.4 - 243.4
ST012-LSZ12	SEE	207 - 243
ST012-LSZ14	SEE	204.8 - 239.8
ST012-LSZ17	SEE	206.2 - 241.8
ST012-LSZ23	SEE	210 - 245
ST012-LSZ26	SEE	210 - 245
ST012-LSZ28	SEE	210 - 245
ST012-LSZ29	SEE	210 - 245
ST012-LSZ36	SEE	210 - 245
ST012-LSZ37	SEE	210 - 245
ST012-LSZ38	SEE	210 - 245
ST012-LSZ39	SEE	210 - 245

Notes:
ft bgs – feet below ground surface
SEE – steam enhanced extraction
[1]ST012-LSZ18 and ST012-LSZ35 were incorrectly identified as part of the extraction well system in Addendum 2, Table 4-2 which will be corrected when the document is finalized. They are not included in the containment extraction wells listed here.

Each extraction well will be equipped with a Grundfos Model 25S20-11 stage submersible pump with a 2 hp 460V/3-phase Franklin Electric motor. The motor will be controlled using a WEG Model CFW08 VFD, which will be installed locally to the well and operated independent of the treatment system. The VFD is encased in a NEMA 4X-rated wash down duty enclosure. The extraction well pumps are designed to operate at 15 gallons per minute (gpm) with a total dynamic head of 250 feet. There are currently two extraction well pumps and VFDs on-site as backup replacement units. Previous pump operation and maintenance issues documented during the pre-SEE containment study were due to old and degraded equipment associated with the Thermal Enhanced Extraction pilot study. For the post-SEE containment system, pumps will be new and were selected for temperature and jet fuel compatibility. The prior pump issues are not expected to have a significant impact.

Extraction well pumps will be installed with 1-1/4" steel riser piping. Extraction wells will contain ¾" steel sounding tubes for installation of pressure and temperature transducers, which will connect to the local pump motor VFD. Extraction wells will be completed with a well cap with sealed riser piping penetration within a flush-mounted well box.

Extraction well pump VFDs will be used to maintain a defined groundwater level at each location. The capacity of this extraction system is higher than the previous containment system that was effective at ST012 prior to SEE. Once operating, well flow rate will be controlled by the VFD to maintain a water elevation in the well. The groundwater elevations will be monitored as discussed in Section 4 and adjustments to both the number and location of wells pumping and the elevation setpoints will be optimized during active containment operations. The total extraction flow rate from the wellfield is expected to be less than 75 gpm following optimization (average pre-SEE containment system pumping rate was 15-20 gpm). Individual well flow rates will vary based on water level elevation.

If light non-aqueous phase liquids (LNAPL) enter the extraction well during active pumping, it will either be captured by the pump and transferred to the treatment system where it will be separated and removed, or it will accumulate in the well above the pump intake. LNAPL accumulation in extraction wells will be monitored as described in Section 4. LNAPL will be removed periodically from extraction wells at varying frequencies, dependent on the rate of accumulation and the location of the well screen relative to water and LNAPL elevation.

Groundwater removed by the extraction well network will be pumped to the groundwater treatment system as discussed in the next section.

3.2 Groundwater Treatment System Installation

The groundwater treatment system is the same system detailed in Sections 3.2.2 and 4.1.3 of Addendum 2 with minor updates (e.g., potential chemical treatments, permit details, and alarm notifications) for clarification. Groundwater treatment will include LNAPL removal using a gravity separator, particulate filtration using bag filters, and dissolved volatile organic compound (VOC) treatment using granular activated carbon (GAC) adsorption. A process flow diagram for the treatment system is included as Figure 3-1 in **Attachment 1**.

The groundwater treatment system will be controlled using a main control panel (MCP), consisting of a programmable logic controller and associated modules for resolving logic and recording monitoring data to operate the groundwater extraction treatment system. Water pumped by the extraction well pumps will be directed through a tee fitting where a chemical feed pump will inject chemical into the water stream and will pass through a

static mixer prior to discharge into an equalization tank. The chemical feed system will consist of a chemical feed tote, located within secondary containment and a chemical feed pump that will be controlled using the MCP.

Water level in the equalization tank will be controlled based on tank level using a downstream centrifugal pump. The equalization pump speed will be controlled using a VFD located in the MCP that receives a level signal from the equalization tank level transmitter. Water leaving the equalization tank will pass a temperature transmitter, which will shut down the system if the temperature is too high for subsequent treatment equipment and discharge into the City of Mesa sewer.

Water pumped by the equalization pump will pass through primary and standby bag filters to a gravity separator. The gravity separator may be bypassed if deemed unnecessary based on composition of the influent water. The gravity separator will be located in secondary containment, and water level in the gravity separator will be controlled using a downstream centrifugal pump. The gravity separator pump speed will be controlled using a VFD located in the MCP that receives a level signal from the gravity separator level transmitter. LNAPL skimmed using the gravity separator will flow by gravity into up to three interconnected LNAPL drums within secondary containment or a dedicated double-walled LNAPL tank.

After gravity separation, process water will pass through a tee fitting where a feed pump will inject chemical (e.g., biocide, defoamer, or descaler), if necessary, into the water stream and will pass through a static mixer prior to discharge into the air stripper. The chemical feed system will consist of a chemical feed tote, located within secondary containment and a chemical feed pump that will be controlled using the MCP.

After passing through the static mixer, process water will enter an air stripper which will be manually started by a local on/off switch by the system operator. The air stripper may be bypassed if deemed unnecessary based on composition of the influent water. All process air treated by the air stripper will be treated by the SVE thermal oxidizer. Process water leaving the air stripper sump will be pumped by the air stripper pump using level switches in the air stripper sump.

Process water from the air stripper sump will be pumped through a bag filter, and through GAC vessels. The existing GAC vessels for SEE treatment will be used during containment. The vessels are set up as two parallel trains of two vessels in series. Process water leaving the granulated activated carbon vessels will be directed to the City of Mesa sewer for discharge in accordance with the City of Mesa permit (M5863-0818 or revision).

The flow capacity of the groundwater treatment system is approximately 100 gpm. Bag filtration and GAC adsorption will use existing process equipment previously used in the SEE system. An existing gravity separator, previously used at ST012 during

containment system operations, will be used as part of the treatment train. Where possible, existing SEE piping will be used to connect the groundwater treatment system. All reused equipment has been evaluated for effective use at the expected groundwater flow rate.

The groundwater treatment system will be constructed with interlocking controls. These controls will include level, pressure, and flow monitoring to protect the equipment and prevent unintended releases of contamination. In the event of a system shutdown, interlocking system controls will notify operations personnel of shutdown. Upon receipt of notification, operations personnel will respond accordingly.

4.0 PERFORMANCE MONITORING

Active containment performance monitoring will be conducted to provide data for evaluation of containment effectiveness as detailed in this section and Appendix H of Addendum 2. Following construction of the GWETS, monitoring of system operations will include a combination of process monitoring (e.g., pressures, flow rates) and analytical monitoring for dissolved concentrations of site COCs. This section discusses the performance monitoring specific to active containment. Table 4-1 summarizes the monitoring, sampling, and analysis methods and frequencies. Additional detail for performance monitoring sampling and analysis is included in the QAPP/SAP (included as Appendix H of Addendum 2 [Amec Foster Wheeler, 2016]). The information presented in Table 4-1 is taken from and in some cases updated from Table 5-1 in Addendum 2. Baseline sampling of extraction wells as specified in Addendum 2 Table 5-1 has been completed and results were posted to project SharePoint.

Upon the completion of GWETS commissioning and startup, performance evaluation for active containment will commence based on groundwater elevation monitoring and with consideration of post-SEE characterization information. Data will be reported in BCT meetings/calls and documented in the ST012 quarterly reports.

Table 4-1 Active Containment Monitoring, Sampling, and Analysis Methods and Frequencies

Media	Locations	Monitoring/ Analysis	Frequency	Sample Purpose	Additional Information in Addendum 2 QAPP/SAP
Extraction Well Monitoring					
Liquid	• Operational extraction locations (initially 22 as listed in Table 3-1)	• Document date and elevation of setpoint changes	• As needed based on setpoint changes	• Performance and Operational Strategy (plume containment)	• Yes

Table 4-1 Active Containment Monitoring, Sampling, and Analysis Methods and Frequencies

Media	Locations	Monitoring/ Analysis	Frequency	Sample Purpose	Additional Information in Addendum 2 QAPP/SAP
		• Water level and LNAPL level measurements • Remove LNAPL if <5 feet[1] from screened interval in UWBZ and LSZ and if >1 foot thickness in CZ	• Biweekly for initial month of operation, and then either monthly or quarterly based on LNAPL recharge	• Removal of LNAPL; optimization of extraction well flow	• No
Groundwater Monitoring Well Sampling (Addendum 2 Table 5-1 modified for containment extraction)					
Liquid	Groundwater monitoring wells[4][7][8]: • ST012-C02 • ST012-CZ23[4] • ST012-CZ24[4] • ST012-U02 • ST012-U37 • ST012-U38 • ST012-UWBZ38[6] • ST012-RB-3A • ST012-W24 • ST012-W34 • ST012-W38 • ST012-LSZ52[6] • ST012-LSZ54[6] • ST012-LSZ55[6]	• VOCs (8260B)	• Quarterly	• Performance and Operational Strategy (plume containment)	Yes
Liquid	• ST012-C02 • ST012-CZ16 • ST012-CZ22[6] • ST012-CZ23[6] • ST012-CZ24[6] • ST012-CZ25[6] • ST012-U02 • ST012-U11 • ST012-U12 • ST012-U37	• Groundwater Elevations	• Monthly for the first six months, then quarterly	• Performance and Operational Strategy	No

Table 4-1 Active Containment Monitoring, Sampling, and Analysis Methods and Frequencies

Media	Locations	Monitoring/ Analysis	Frequency	Sample Purpose	Additional Information in Addendum 2 QAPP/SAP
	• ST012-U38 • ST012-UWBZ21 • ST012-UWBZ36(6) • ST012-UWBZ37(6) • ST012-UWBZ38(6) • ST012-UWBZ39(6) • ST012-RB-3A • ST012-W11 • ST012-W12 • ST012-W24 • ST012-W34 • ST012-W37 • ST012-W38 • ST012-LSZ32 • ST012-LSZ52(6) • ST012-LSZ53(6) • ST012-LSZ54(6) • ST012-LSZ55(6) • ST012-LSZ56(6) • ST012-LSZ57(6) • ST012-LSZ58(6) • ST012-LSZ59(6)				
Liquid	• All ST012 wells (excluding extraction wells monitored as discussed above)	• Screen for LNAPL (presence and thickness) • Remove LNAPL if >5-10 feet(2) thickness in UWBZ and LSZ and >1 foot thickness in CZ	• Every one to four weeks (varies by well based on LNAPL presence; continue current frequencies and adjust; frequencies may be further reduced for wells with no current or historical LNAPL presence)	• Mass removal	No
Process Water Sampling (Same as Addendum 2 Table 5-1)					
Liquid	• Treatment System Influent	• VOCs (8260B)	• Monthly	• Performance (mass removal)	Yes

Table 4-1 Active Containment Monitoring, Sampling, and Analysis Methods and Frequencies

Media	Locations	Monitoring/ Analysis	Frequency	Sample Purpose	Additional Information in Addendum 2 QAPP/SAP
Liquid	• GAC Influent • GAC Midfluent • GAC Effluent	• VOCs (8260B)[3]	• Weekly for influent and midfluent until influent concentrations stabilize, then monthly, quarterly at effluent	• Performance (mass removal by GAC) • Operation (breakthrough at Midfluent) • Compliance (effluent discharge permit)	Yes
		• SVOCs (8270)[3]	• Monthly[3]		
		• Pesticides/PCBs (8081/8082)[3] • HRGC/HRMS Pesticides (1699)[5]	• 8081/8082 Monthly with a second sample sent for HRGC/HRMS analysis if there are any detections of prohibited compounds[3][5]		
	• Effluent Discharge	• Liquid Discharge Flow Rate	• Daily flow meter readings[3]	• Compliance (effluent discharge permit)	No

Notes:

[1]LNAPL may accumulate above the UWBZ/LSZ well screens. LNAPL removal from extraction wells will require shutdown of the well and removal of the pump, In order to minimize system and containment disruptions, LNAPL will be monitored and then removed if the level is <5 feet above the well screen.

[2] LNAPL monitoring will continue at ST012 wells not used for extraction. Currently, LNAPL removal occurs when thickness is >5 feet. In order to allow for logistical flexibility in scheduling and performing LNAPL removal activities, LNAPL will be monitored and removed if thickness is 5-10 feet.

[3]May be modified based on final discharge permit.

[4]Water quality parameters (pH, temperature, DO, and ORP) will be evaluated at each sampled well using a flow through cell and calibrated probes.

[5]HRGC/HRMS samples will be collected and the extraction step completed at the laboratory. Analysis will only be completed as requested by Amec Foster Wheeler to address uncertainties associated with pesticide detections by the conventional method (8081).

[6]Includes proposed wells for additional characterization which are subject to change.

[7]Focused on downgradient locations at or near cleanup criteria to detect potential plume migration.

[8]Annual groundwater monitoring locations would include additional wells for plume characterization update. If active containment is still ongoing an updated well list incorporating additional installed wells will be proposed prior to the November 2017 annual event.

Addendum 2 – Draft Final Addendum 2, RD/RAWP (Amec Foster Wheeler, 2016)

CZ – cobble zone

DO – dissolved oxygen

EBR – enhanced bioremediation

GAC – granular activated carbon

HRGC/HRMS – high resolution gas chromatography/SVOCs- semi-volatile organic compounds high resolution mass spectrometry

LSZ – lower saturated zone

ORP – oxidation reduction potential

PCBs – polychlorinated biphenyls
QAPP/SAP – Quality Assurance Project Plan/Sampling and Analysis Plan (see Addendum 2, Appendix H)
RD/RAWP - Remedial Design and Remedial Action Work Plan
RODA2 – Record of Decision Amendment 2
SVOCs – semivolatile organic compounds
TPH – total petroleum hydrocarbons
UWBZ – upper water bearing zone
VOCs – volatile organic compounds

5.0 HEALTH AND SAFETY

The activities performed during this phase of remediation do not present any known health and safety concerns that haven't been previously addressed during SEE operations. The work to be performed during this project is on and/or adjacent to areas that may contain hazardous materials on the surface and/or subsurface. Substances that are known to be present at the site include aromatic and chlorinated organic compounds. Elevated subsurface temperatures are also known to exist following SEE.

All activities performed during construction and operation of the active containment GWETS will be covered under the existing site specific Health and Safety Plan (HASP). All subcontractors will provide a HASP covering their specific tasks within the Scope of Work presented in this Memo. Subcontractor HASPs will, at a minimum, comply with the requirements, guidelines, and restrictions located within the Amec Foster Wheeler site-specific HASP.

6.0 SCHEDULE

Construction of the active containment GWETS was initiated as part of Phase 2 of the remedial action (Enhanced Bioremediation [EBR]). EBR construction was halted prior to its completion as requested in the joint EPA/ADEQ letter dated June 28, 2016. In order to restart and complete construction of the active containment GWETS, the following steps will be required:

1. Remobilization of installation subcontractors – assumed duration of two weeks from notice to proceed. Duration may vary depending on subcontractor availability at time of notice to proceed.
2. Finish construction – duration of four weeks after mobilization assuming concurrent pump installation and mechanical/electrical activities.
3. Commissioning/Start-up – duration of up to two weeks to complete startup and prove-out system operation, also subject to availability of the control panel fabricator for troubleshooting.
4. Active containment GWETS operation
    a. During the initial month of operation groundwater elevation monitoring would be used to fine-tune the extraction system for hydraulic control.
    b. The extraction system would then operate until EBR can be implemented or alternate decision is made. The phase 1 EBR implementation design

anticipated only 1-2 weeks of operation (i.e. groundwater extraction) before initiation of sulfate injections.

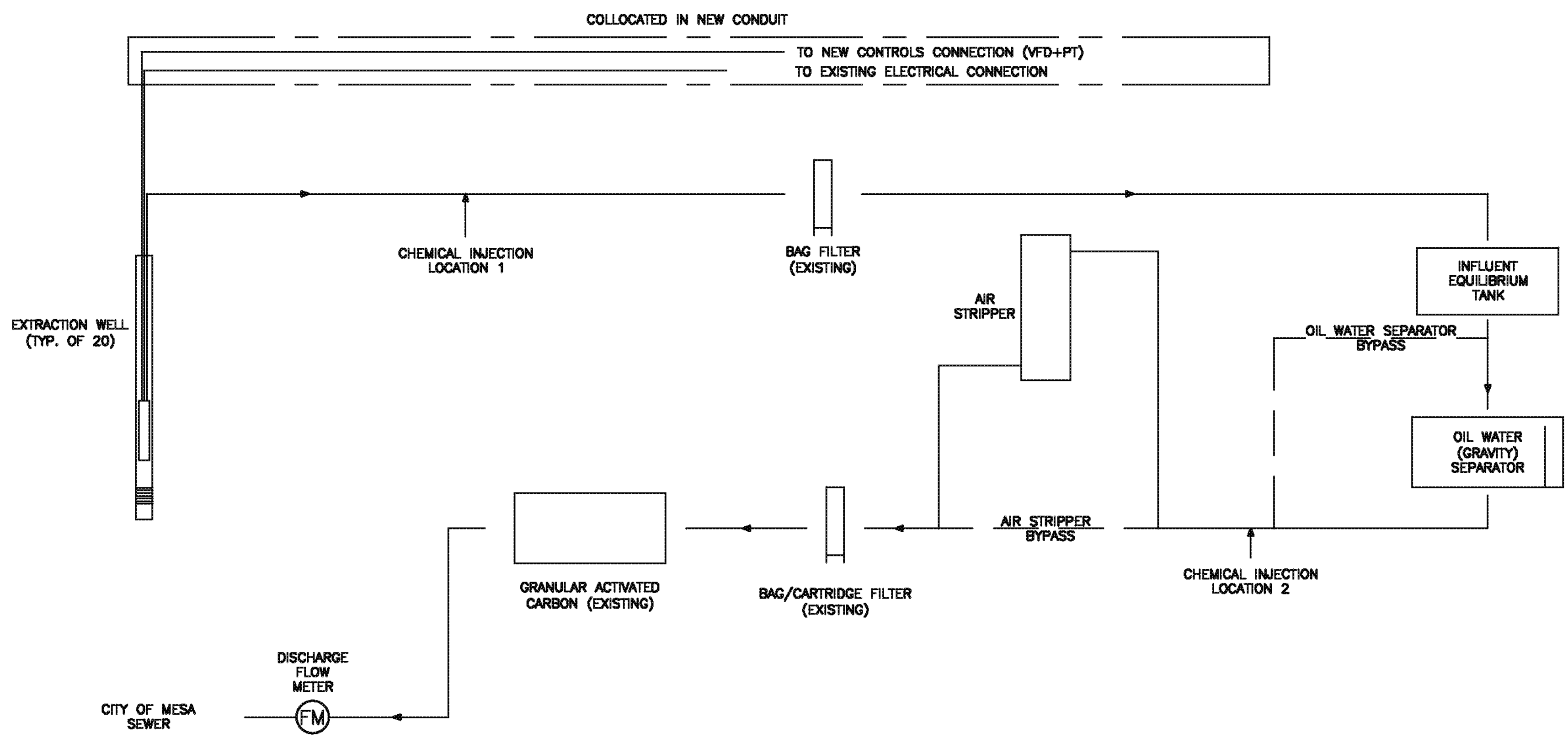
7.0 REFERENCES

AMEC Environment and Infrastructure, Inc. (AMEC), 2013. *Final Groundwater Monitoring Work Plan, Former Liquid Fuels Storage Area, Site ST012, Former Williams Air Force Base, Mesa, Arizona*. September 24, 2013.

AMEC, 2014. *Final Remedial Design and Remedial Action Work Plan for Operable Unit 2 Revised Groundwater Remedy, Site ST012, Former Williams Air Force Base, Mesa, Arizona*. Prepared for the Air Force Civil Engineer Center. 20 May 2014. Contract No. FA8903-09-D-8572 – 0002.

Amec Foster Wheeler Environment & Infrastructure Inc. (Amec Foster Wheeler), 2016. *Draft Final Addendum #2, Remedial Design and Remedial Action Work Plan for Operable Unit 2 Revised Groundwater Remedy, Site ST012, Former Williams Air Force Base, Mesa, Arizona*. Prepared for the Air Force Civil Engineer Center. 15 March 2016. Contract No. FA8903-09-D-8572 – 0002.

ATTACHMENT 1 FIGURES



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Scale:	NONE

Site ST012
Former Williams Air Force Base, Mesa, Arizona

Treatment System Process Flow Diagram

FIGURE **3-1**

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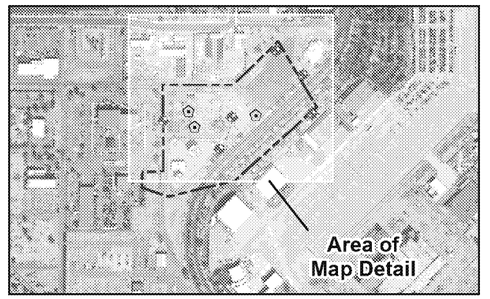

Legend

- Extraction Well Location
- Groundwater Monitoring Well Location
- ST012 Site Boundary

Notes:

ST012-CZ21	Monitoring Well Identification
CZ	Cobble Zone

0 25 50 100 Feet

N

Site ST012 - Former Williams Air Force Base
Mesa, Arizona

EBR Extraction and Monitoring Well Locations - CZ

FIGURE **3-2**

Job No.:	9101110001
PM:	DS
Date:	9/19/2016
Scale:	1" = 100'

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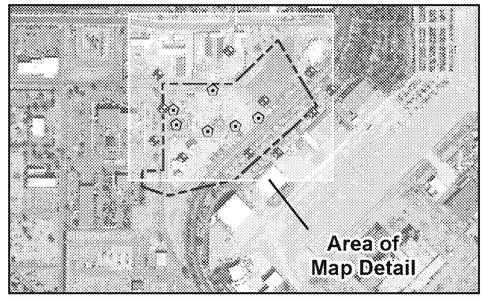

Legend

- Extraction Well Location
- Groundwater Monitoring Well Location
- ST012 Site Boundary

Notes:

ST012-MW12 Monitoring Well Identification
UWBZ Upper Water Bearing Zone

0 25 50 100 Feet

N

Site ST012 - Former Williams Air Force Base
Mesa, Arizona

EBR Extraction and Monitoring Well Locations - UWBZ

FIGURE **3-3**

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Date:	9/19/2016
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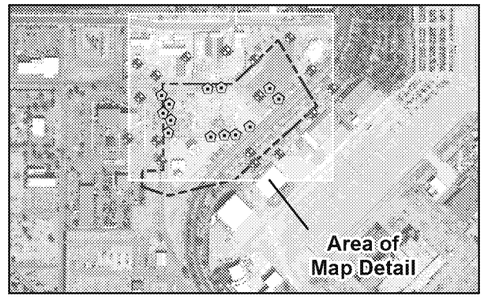

Legend

- Extraction Well Location
- Groundwater Monitoring Well Location
- ST012 Site Boundary

Notes:

ST012-MW12 Monitoring Well Identification
LSZ Lower Saturated Zone

0 25 50 100
Feet

N

Site ST012 - Former Williams Air Force Base
Mesa, Arizona

EBR Extraction and Monitoring Well Locations - LSZ

FIGURE **3-4**

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Date:	9/19/2016
Scale:	1" = 110'

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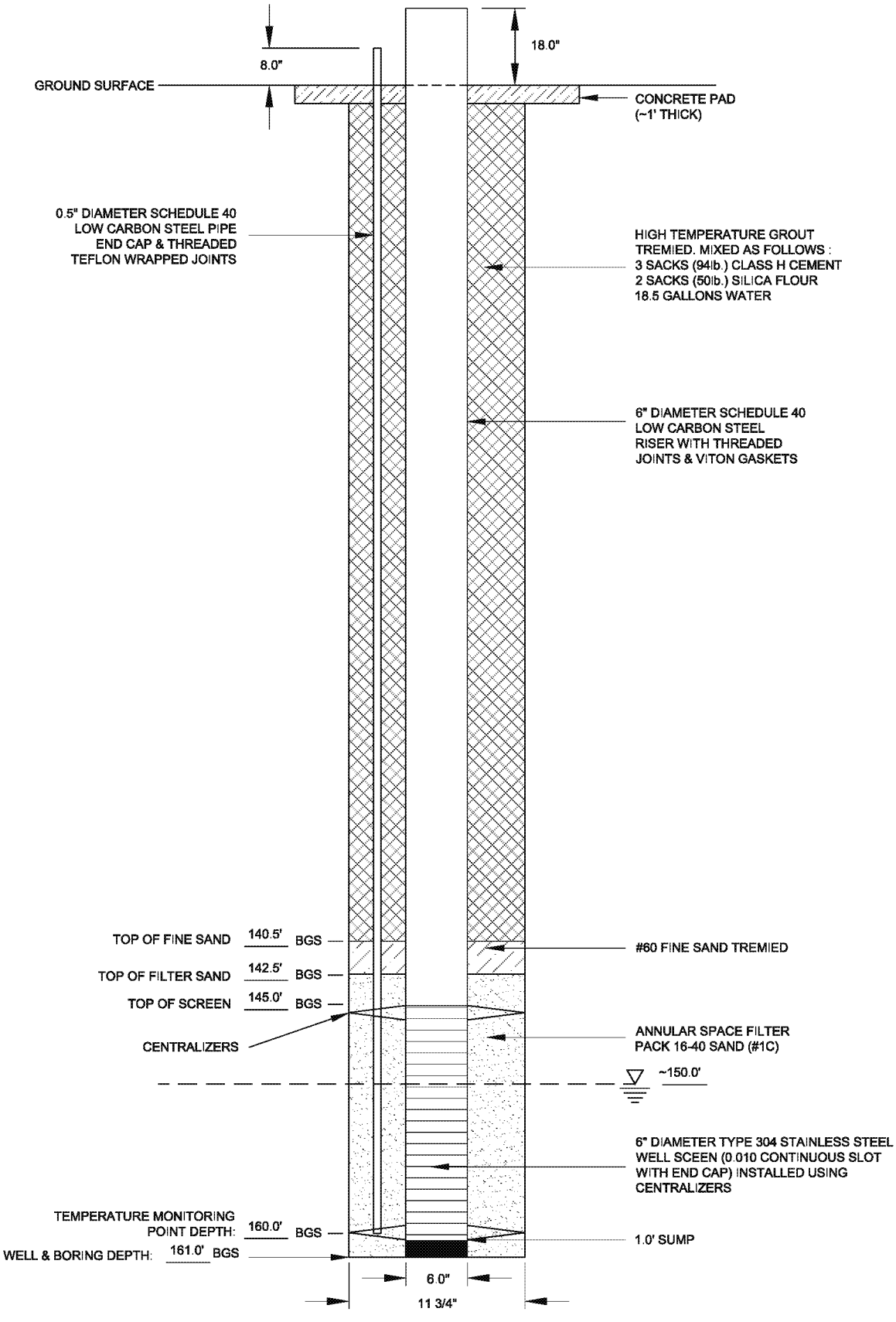
ATTACHMENT 2 WELL CONSTRUCTION LOGS



JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	12-7-13

WELL ID ST012-CZ18
ADWR WELL NO. 55-916080

FORMER WILLIAMS AFB SITE ST012

Environment & Infrastructure, Inc.
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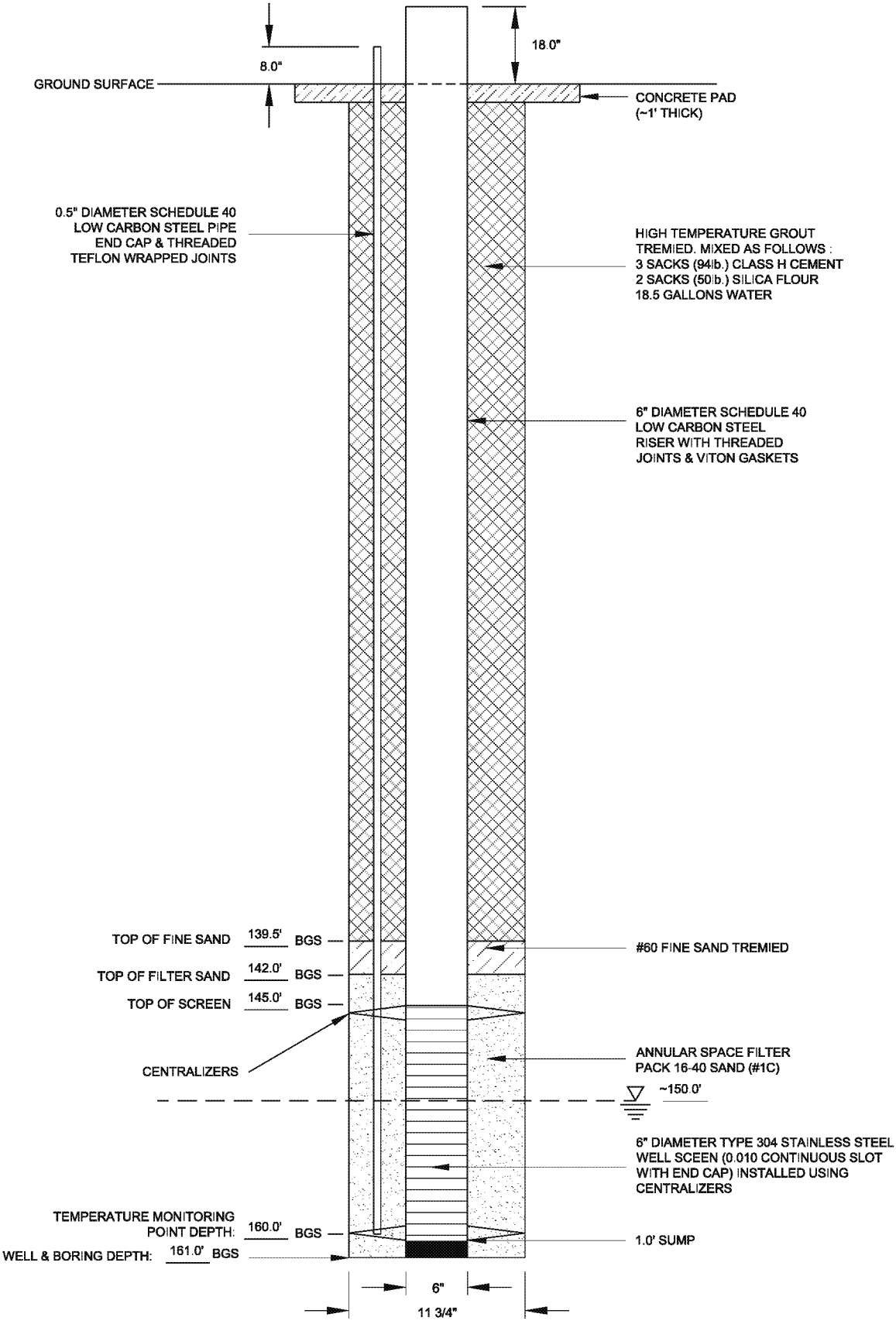
Phoenix, Arizona

P:\Phoenix\2012\91011\10001-Williams Gateway\05-CADD\Site ST012 Wells_6.dwg



JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	10-29-2013

WELL ID ST012-CZ19
ADWR WELL NO. 55-916072

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Environment & Infrastructure, Inc.
4600 East Washington Street, Suite 600
Phoenix, Arizona

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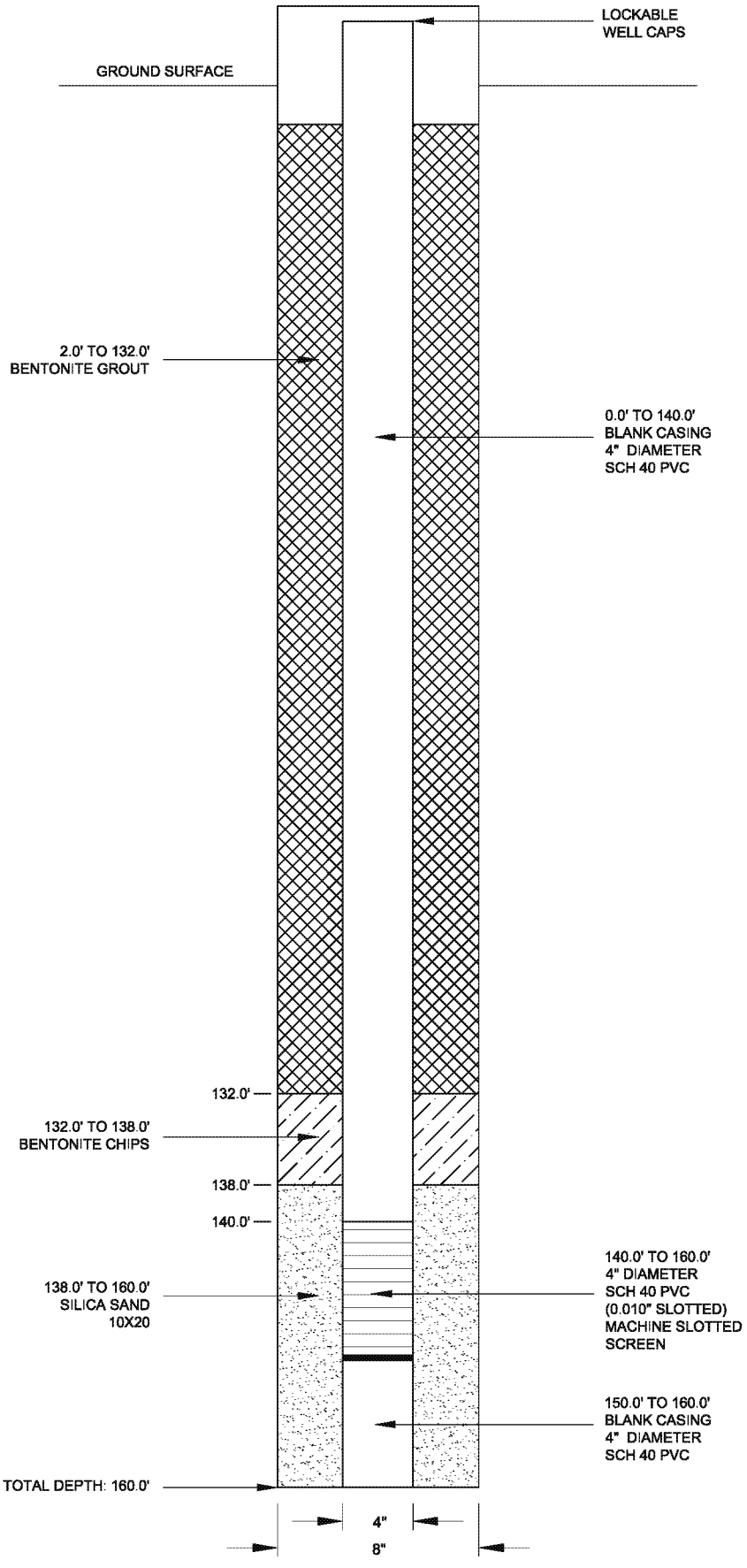

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DESIGN:	GM
DRAWN:	GWH
DATE:	6/2016
SCALE:	NOT TO SCALE

MONITOR WELL CZ21

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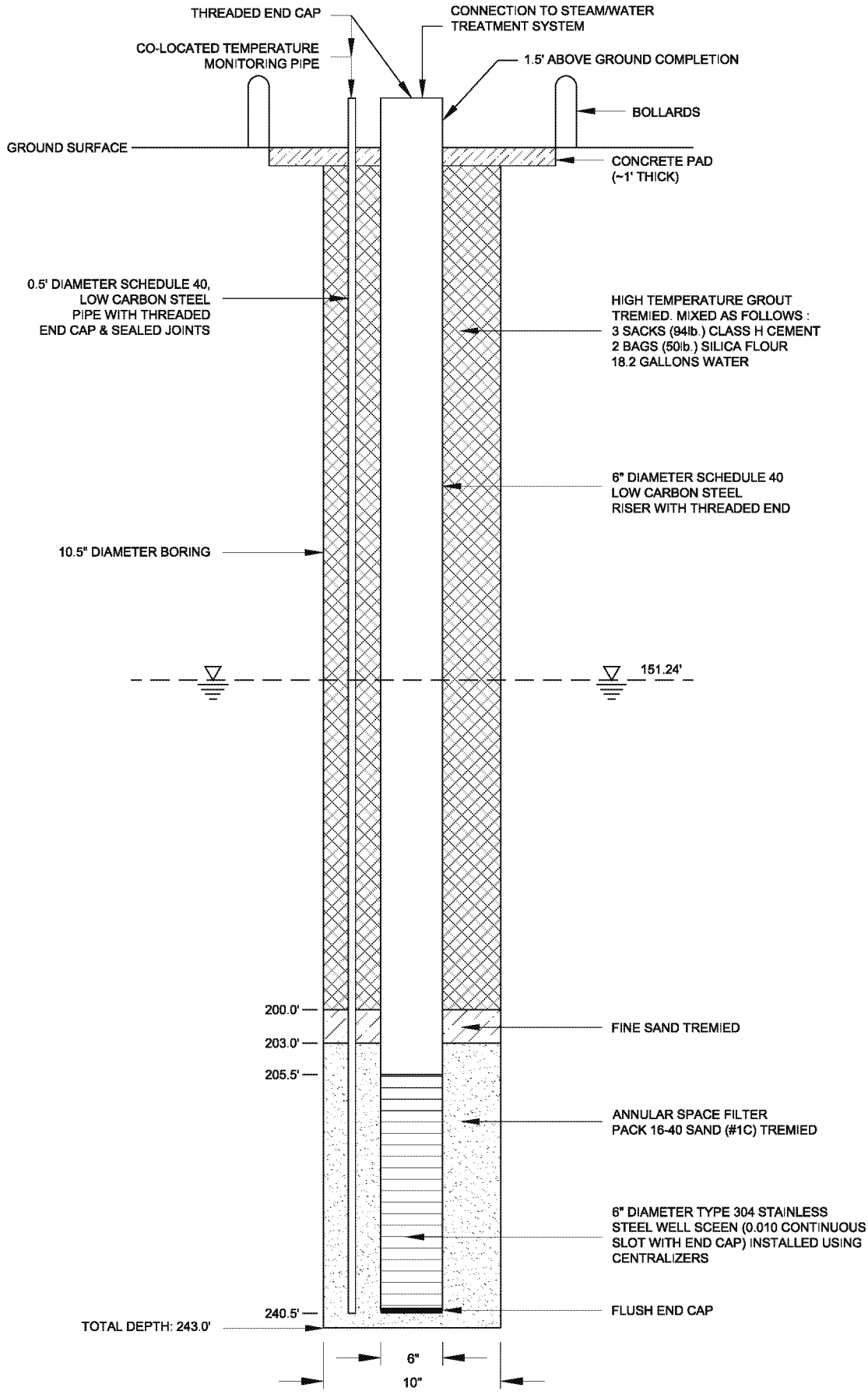

JOB NO.	9101110001
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DRAWN:	GWH
DATE:	5/2013
SCALE:	NOT TO SCALE

FIGURE - X
MONITOR WELL CONSTRUCTION ST012 - LSZ09

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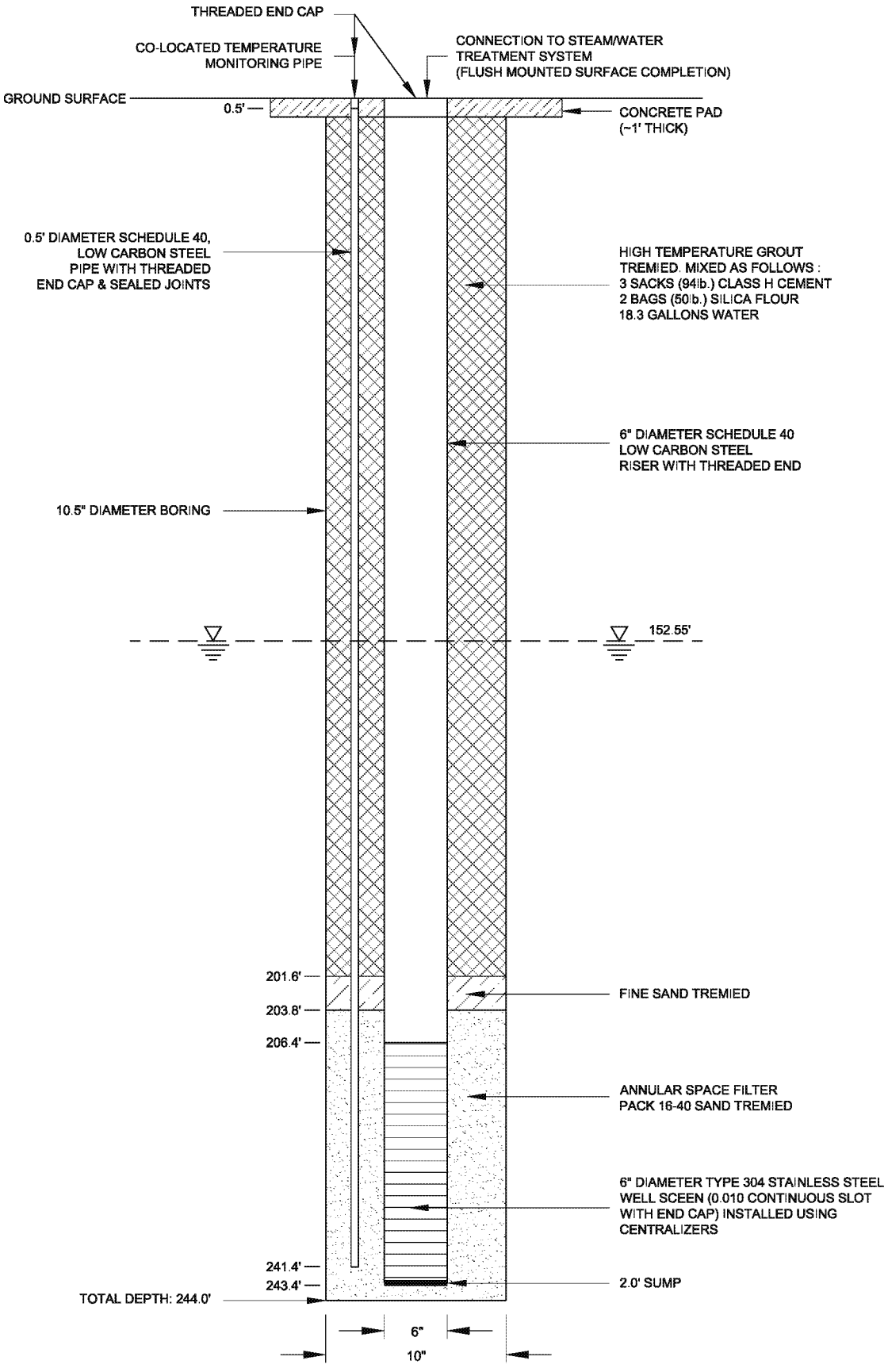

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DATE:	5/2013
SCALE:	NOT TO SCALE

FIGURE - X
MONITOR WELL CONSTRUCTION ST012 - LSZ11

FORMER WILLIAMS AFB SITE ST012

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Phoenix, Arizona

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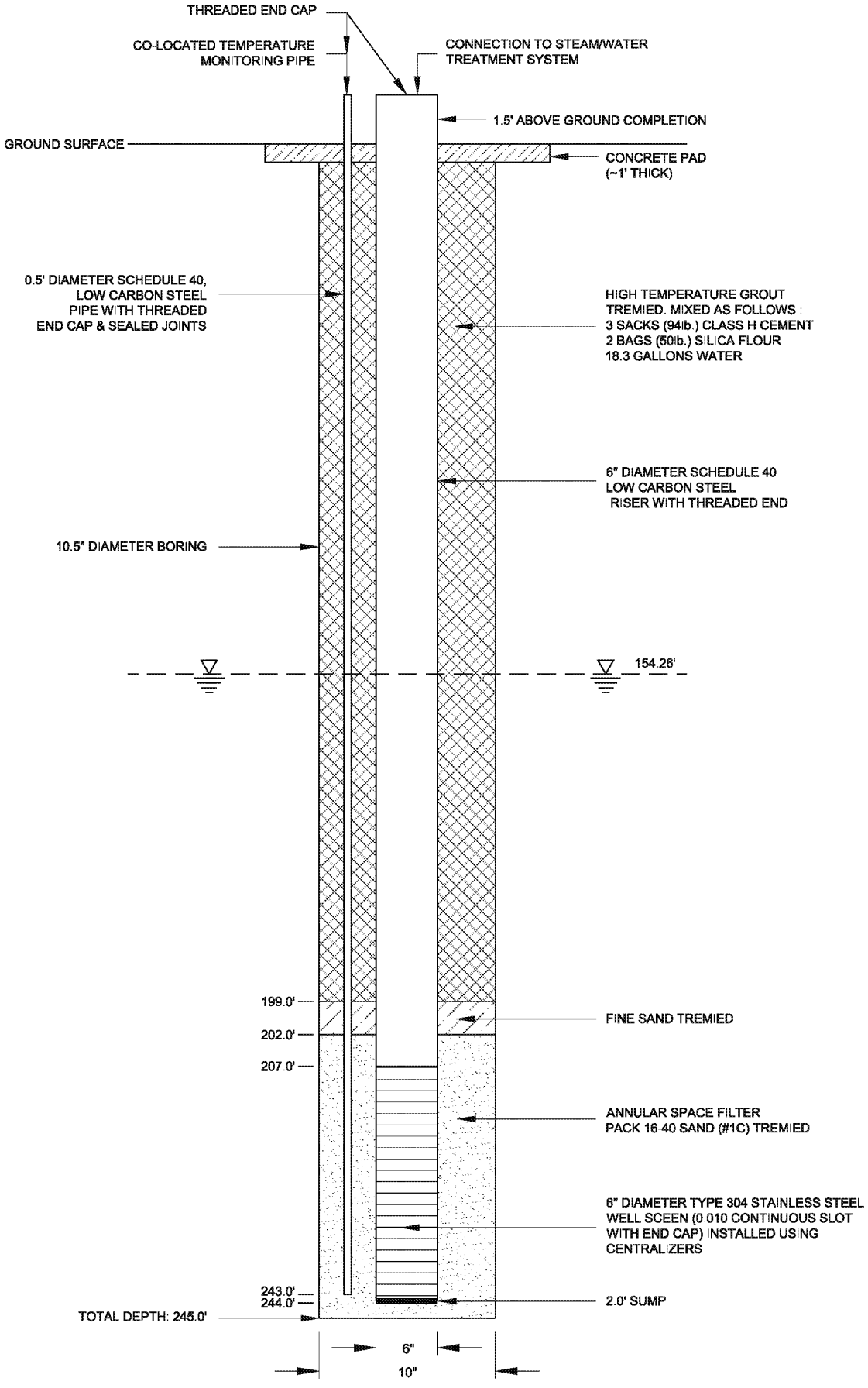

JOB NO.	9101110001
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DRAWN:	GWH
DATE:	5/2013
SCALE:	NOT TO SCALE

FIGURE - X
MONITOR WELL CONSTRUCTION ST012 - LSZ12

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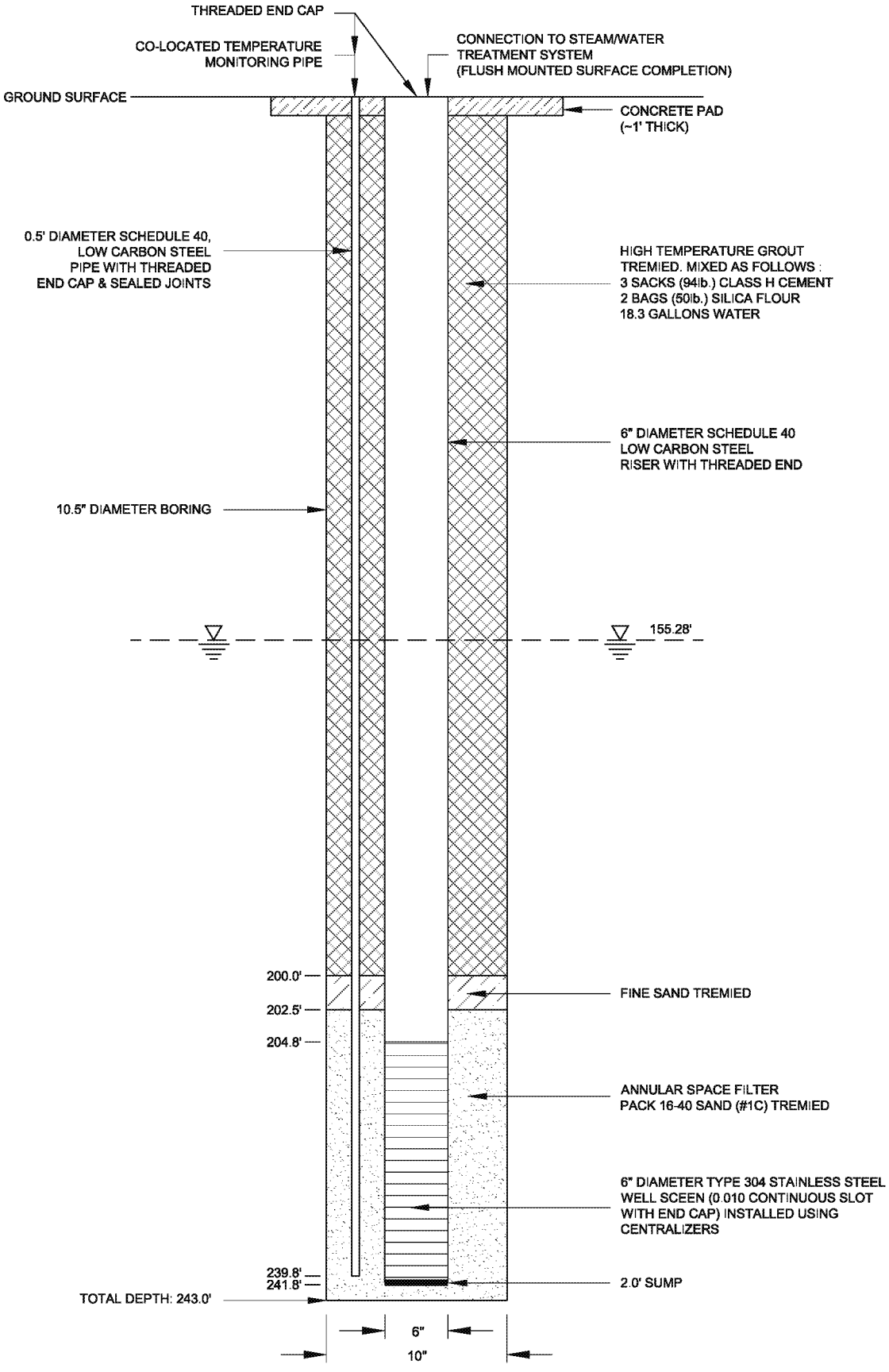

JOB NO.	9101110001
DESIGN:	SW
DRAWN:	GWH
DATE:	5/2013
SCALE:	NOT TO SCALE

FIGURE - X
MONITOR WELL CONSTRUCTION ST012 - LSZ14

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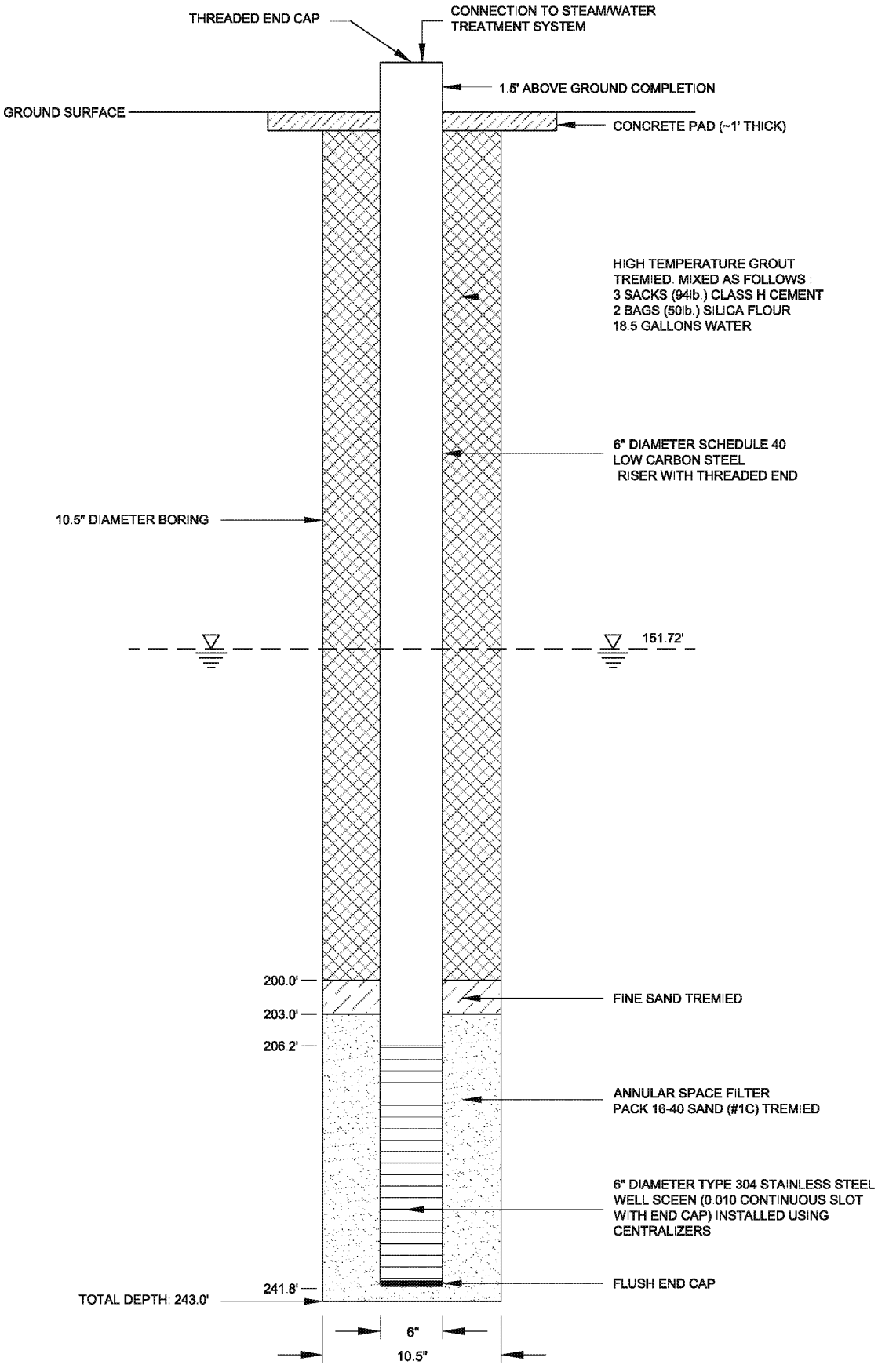

JOB NO.	9101110001
DESIGN:	SW
DRAWN:	GWH
DATE:	5/2013
SCALE:	NOT TO SCALE

FIGURE - X
MONITOR WELL CONSTRUCTION ST012 - LSZ17

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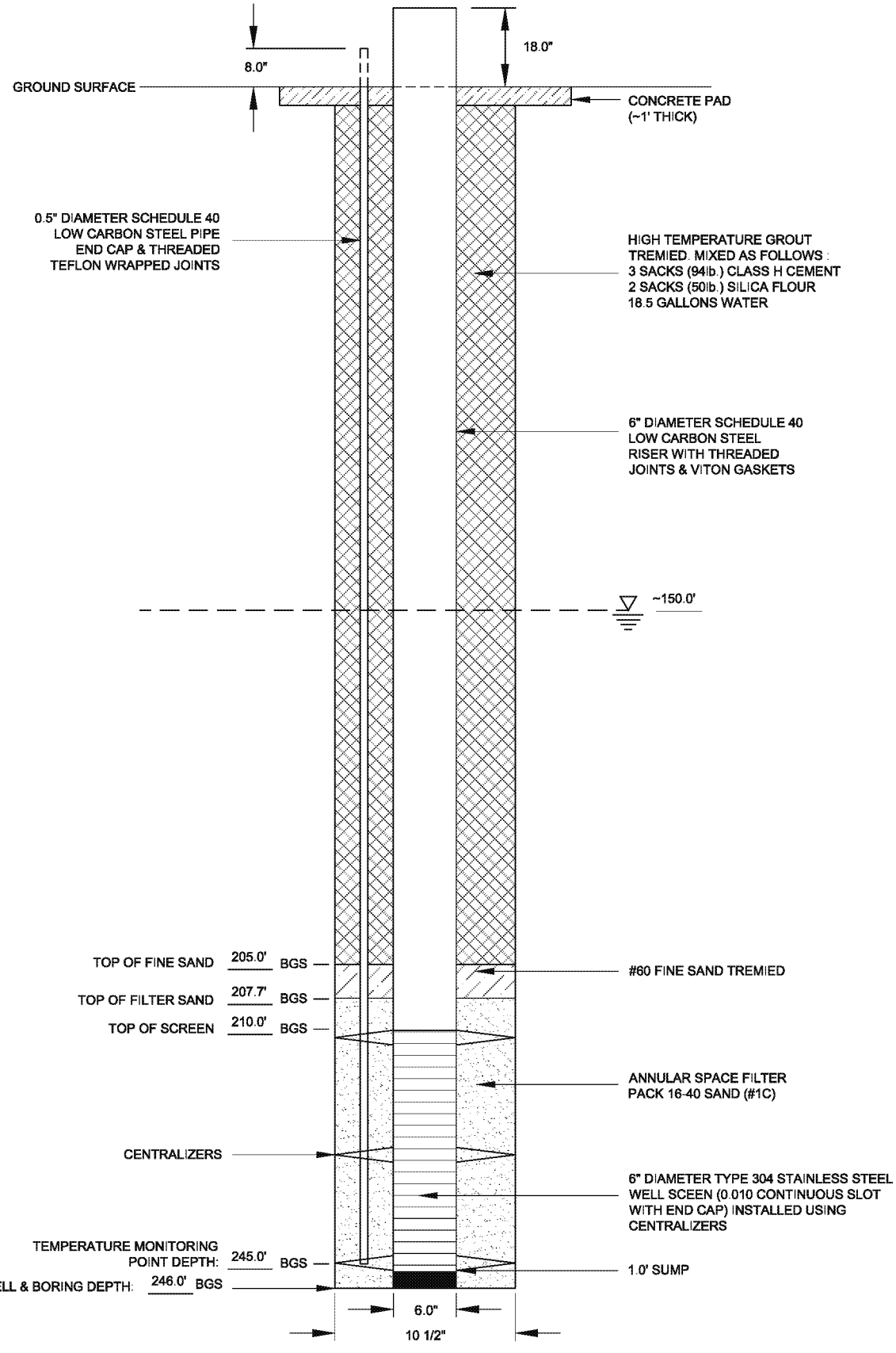

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	10-17-2013

WELL ID ST012-LSZ23
ADWR WELL NO. 55-916044

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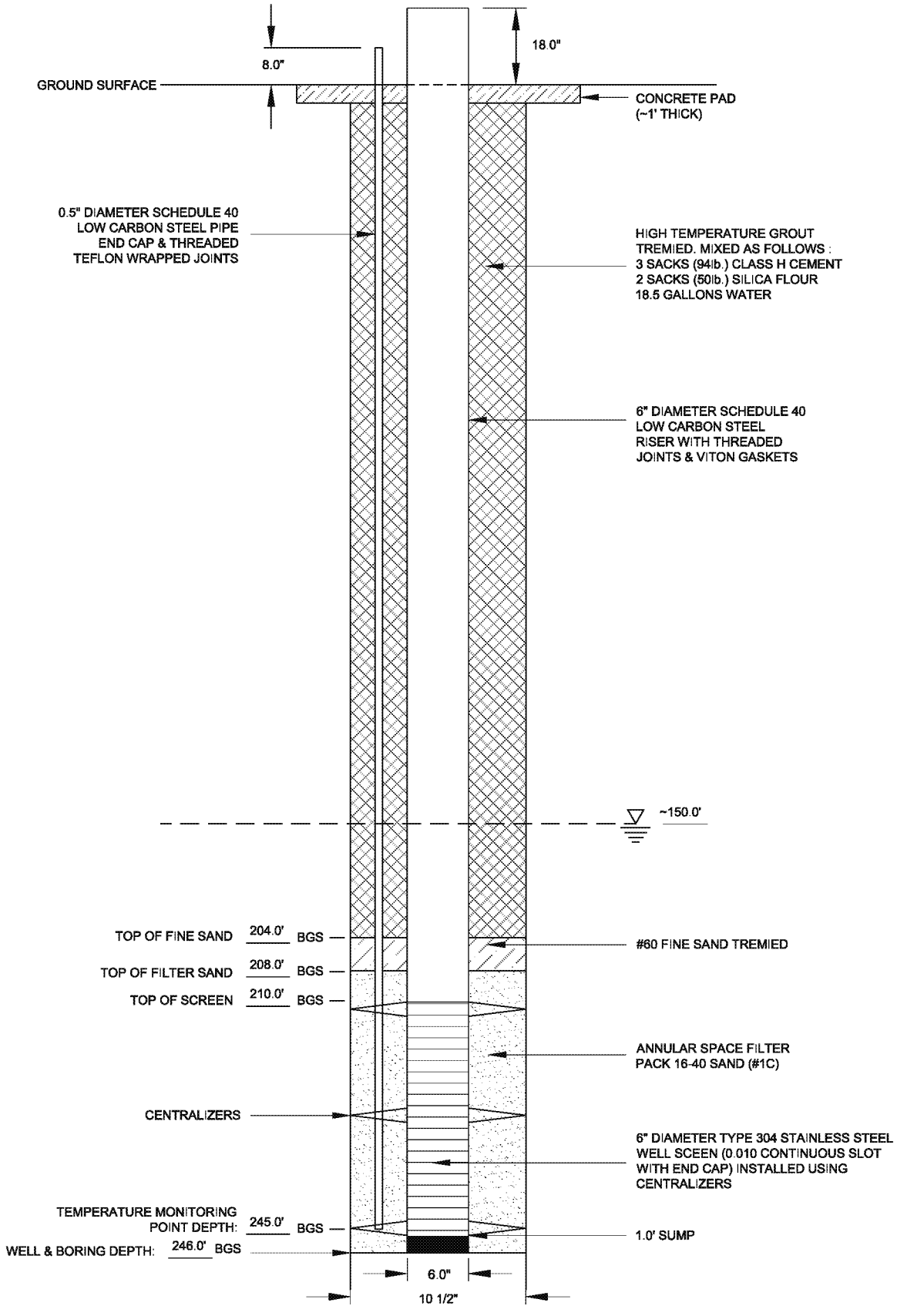

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	11-18-2013

WELL ID ST012-LSZ26
ADWR WELL NO. 55-916130

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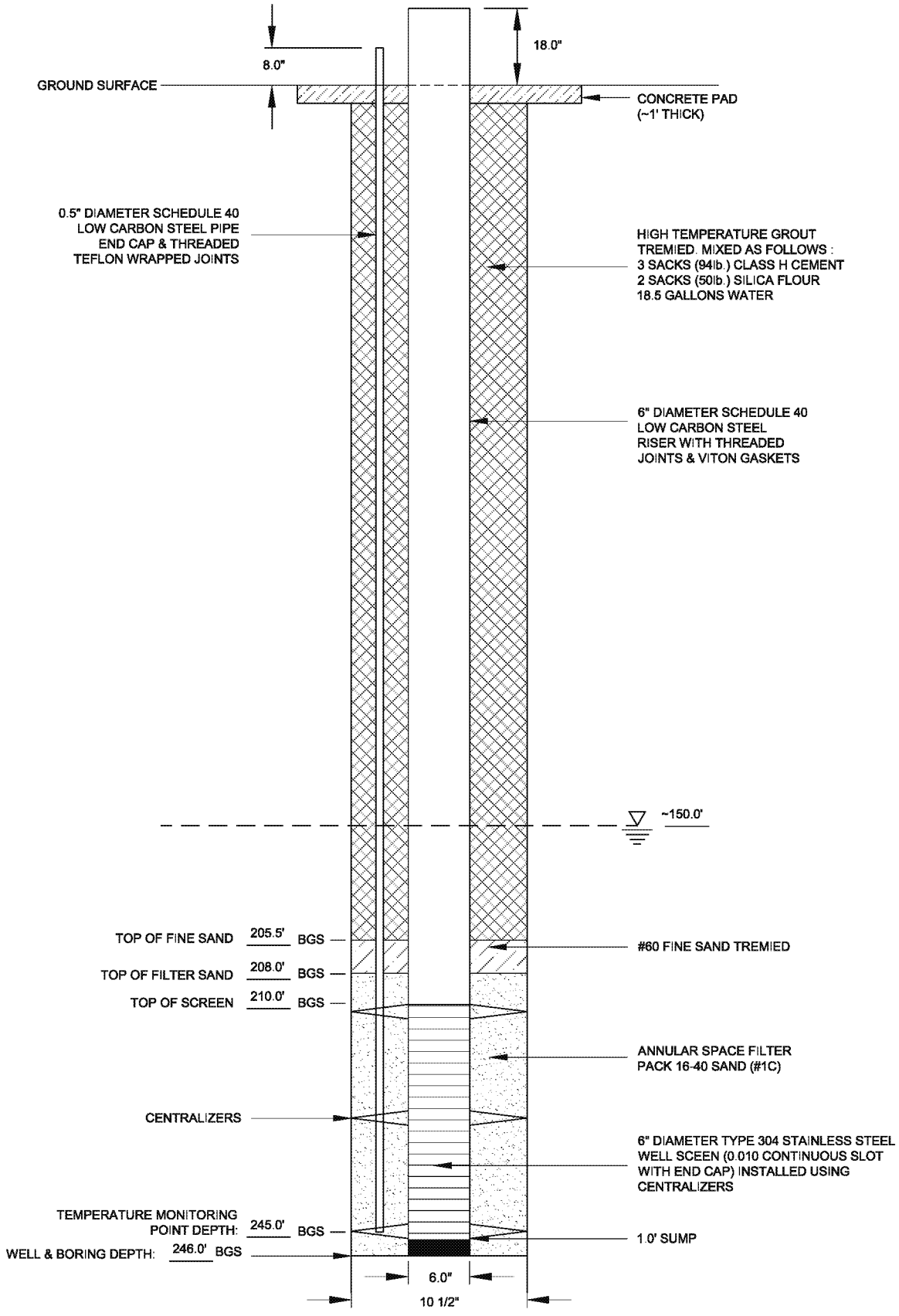

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	11-20-2013

WELL ID ST012-LSZ28
ADWR WELL NO. 55-916131

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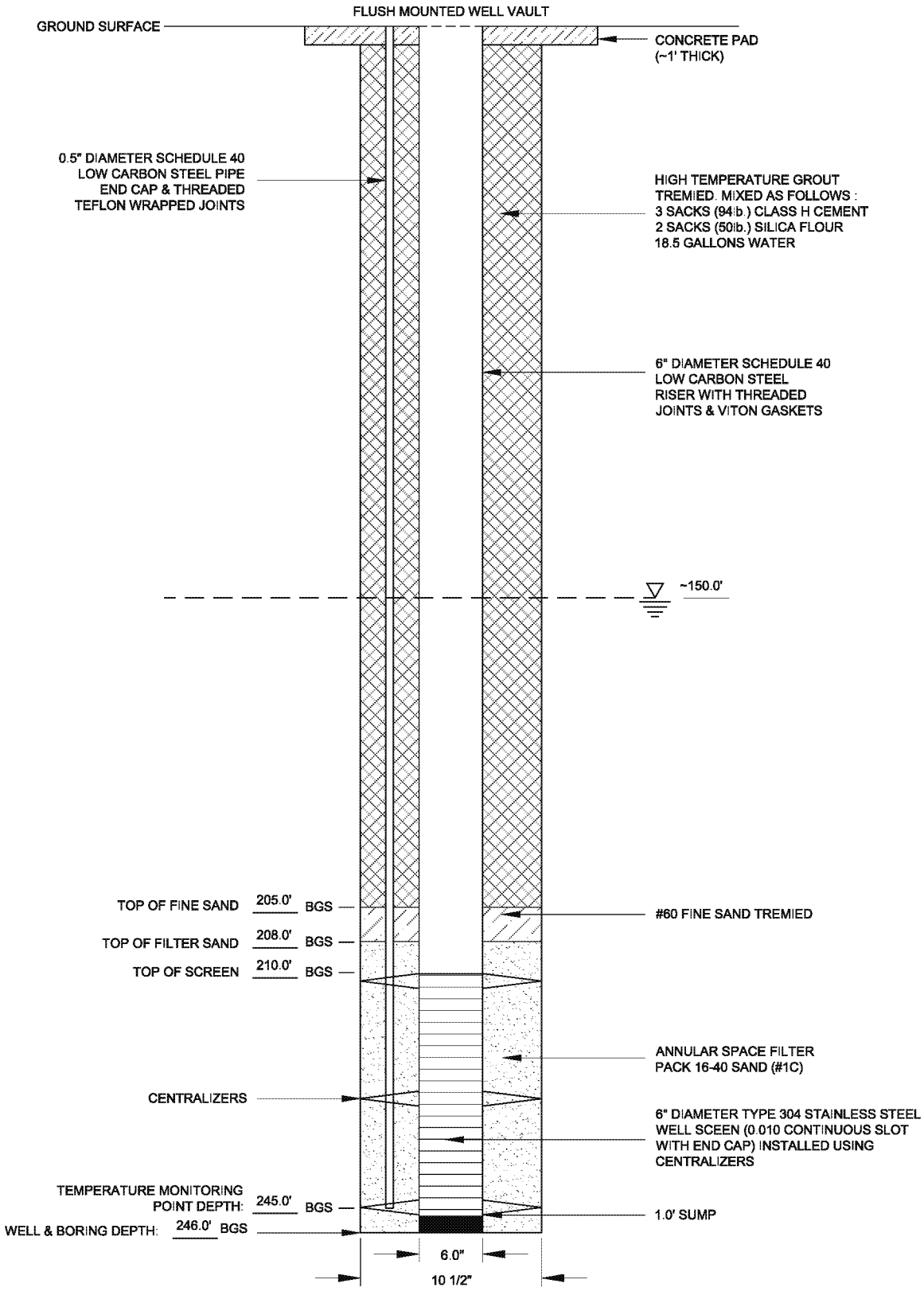

JOB NO.	9101110001
LOGGED BY:	Stephen F.
DATE:	11-7-2013

WELL ID ST012-LSZ29
ADWR WELL NO. 55-916043

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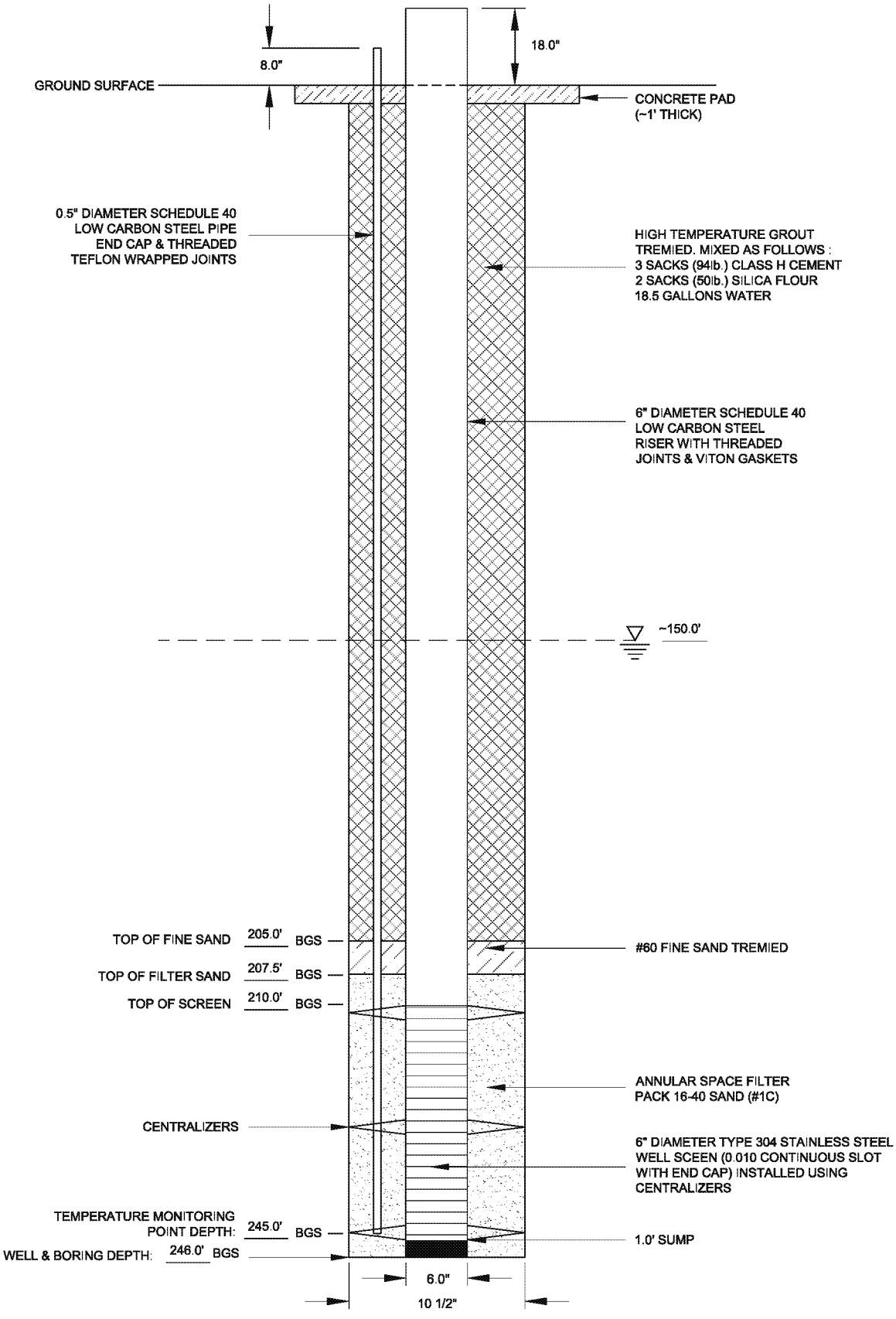

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	12-6-13

WELL ID ST012-LSZ36
ADWR WELL NO. 55-916128

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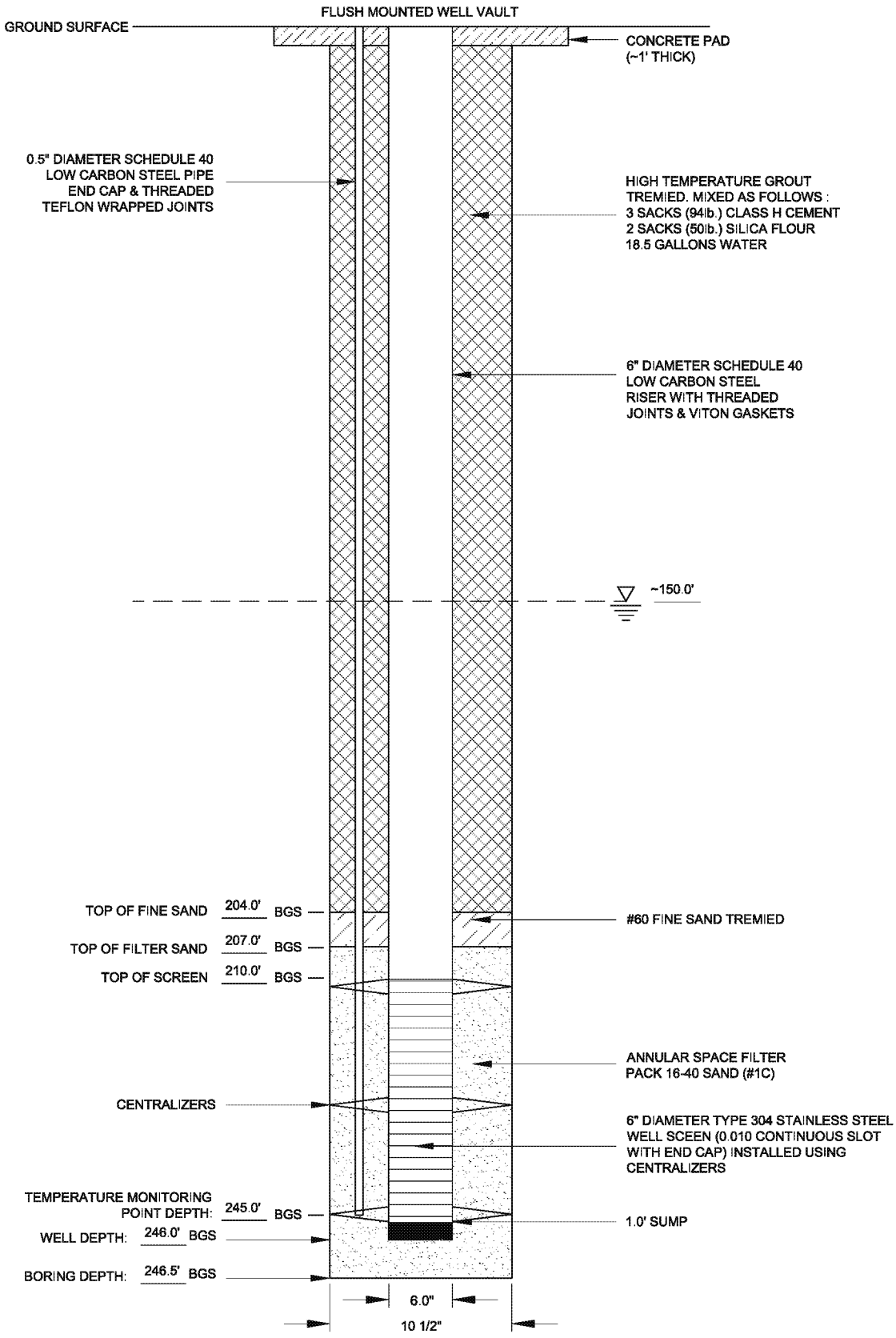

JOB NO.	9101110001
LOGGED BY:	Russell T.
DATE:	12-5-13

WELL ID ST012-LSZ37
ADWR WELL NO. 55-219541

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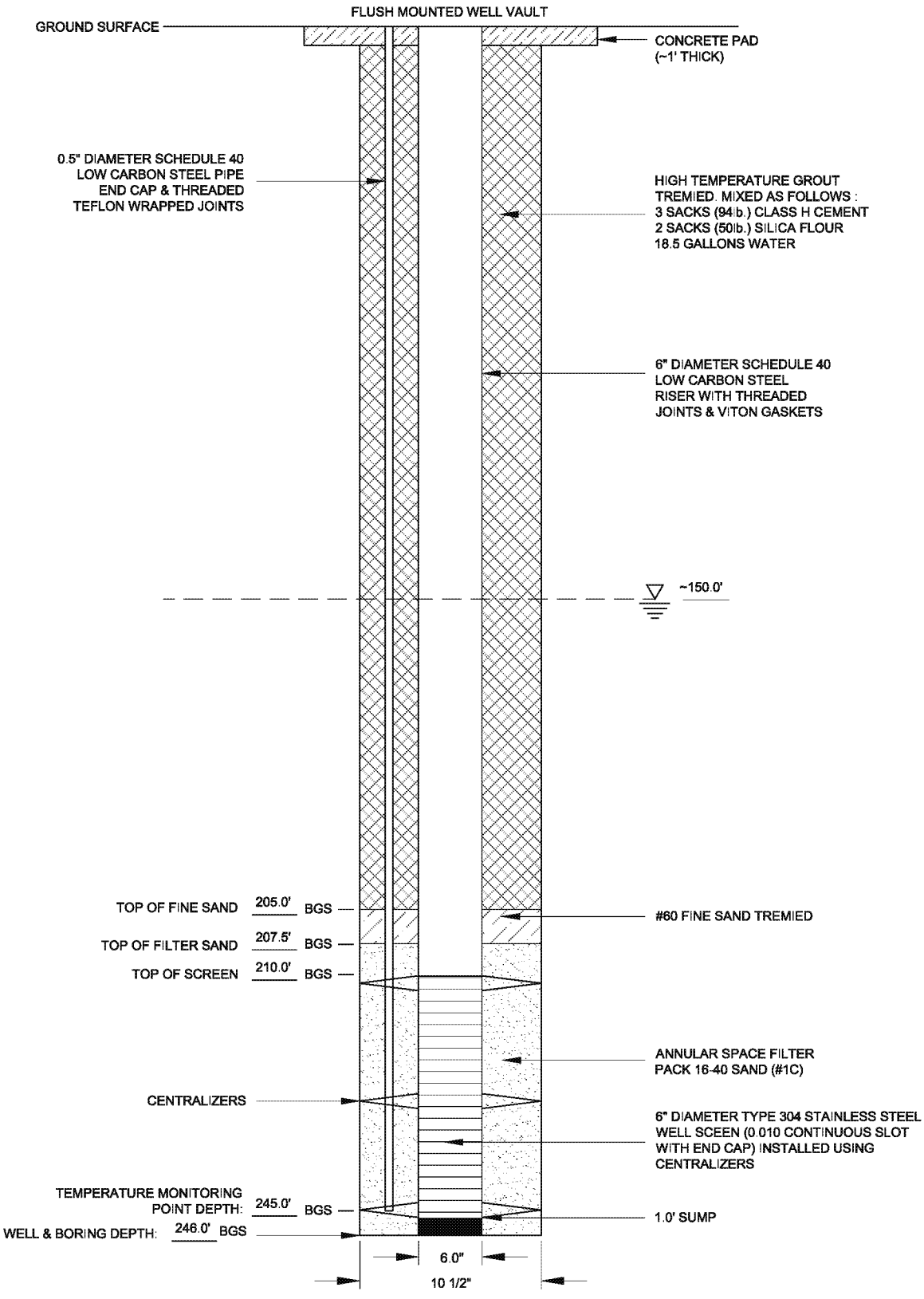

JOB NO.	9101110001
LOGGED BY:	Russell T.
DATE:	12-5-13

WELL ID ST012-LSZ38
ADWR WELL NO. 55-916146

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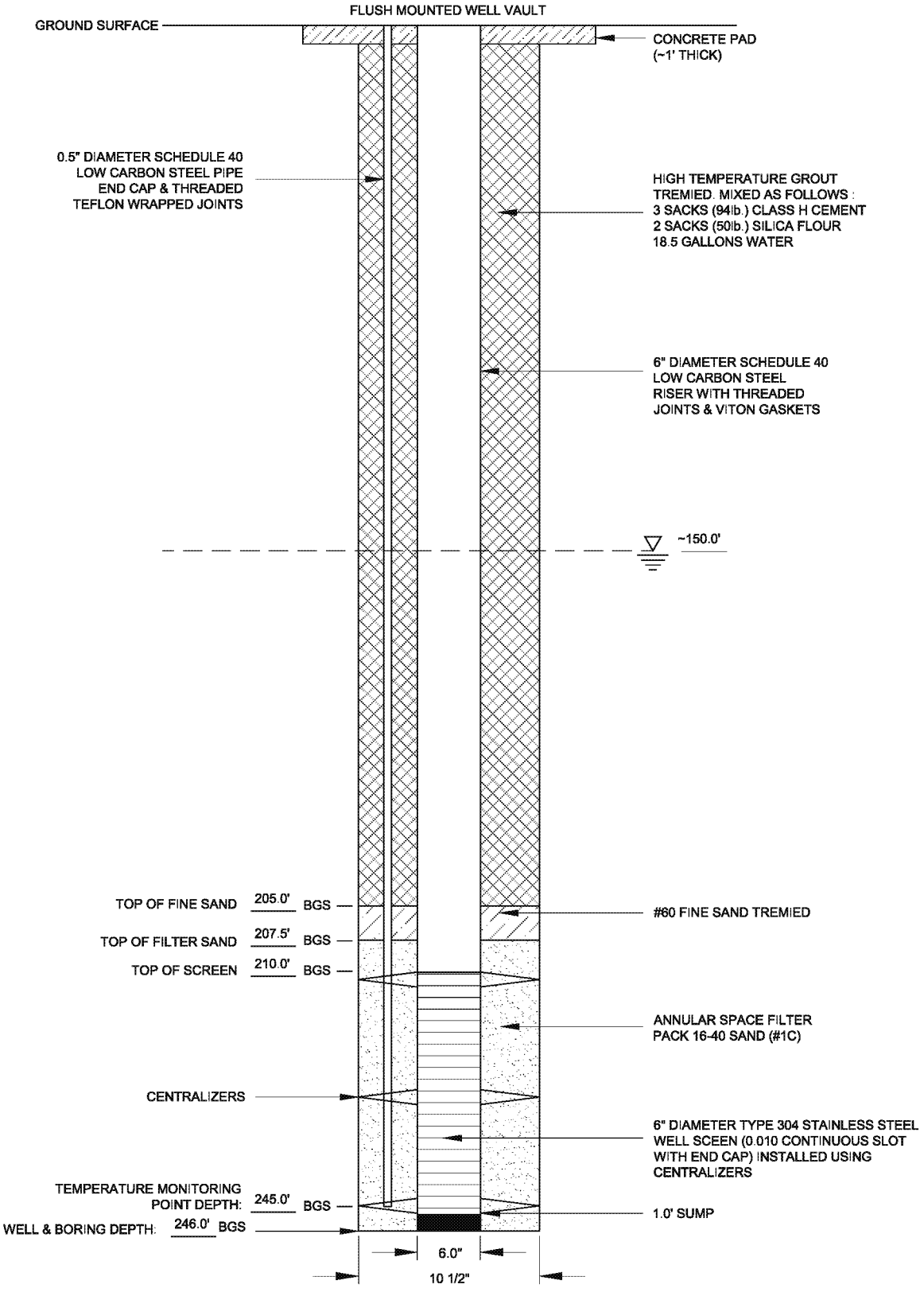

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	10-20-2013

WELL ID ST012-LSZ39
ADWR WELL NO. 55-916060

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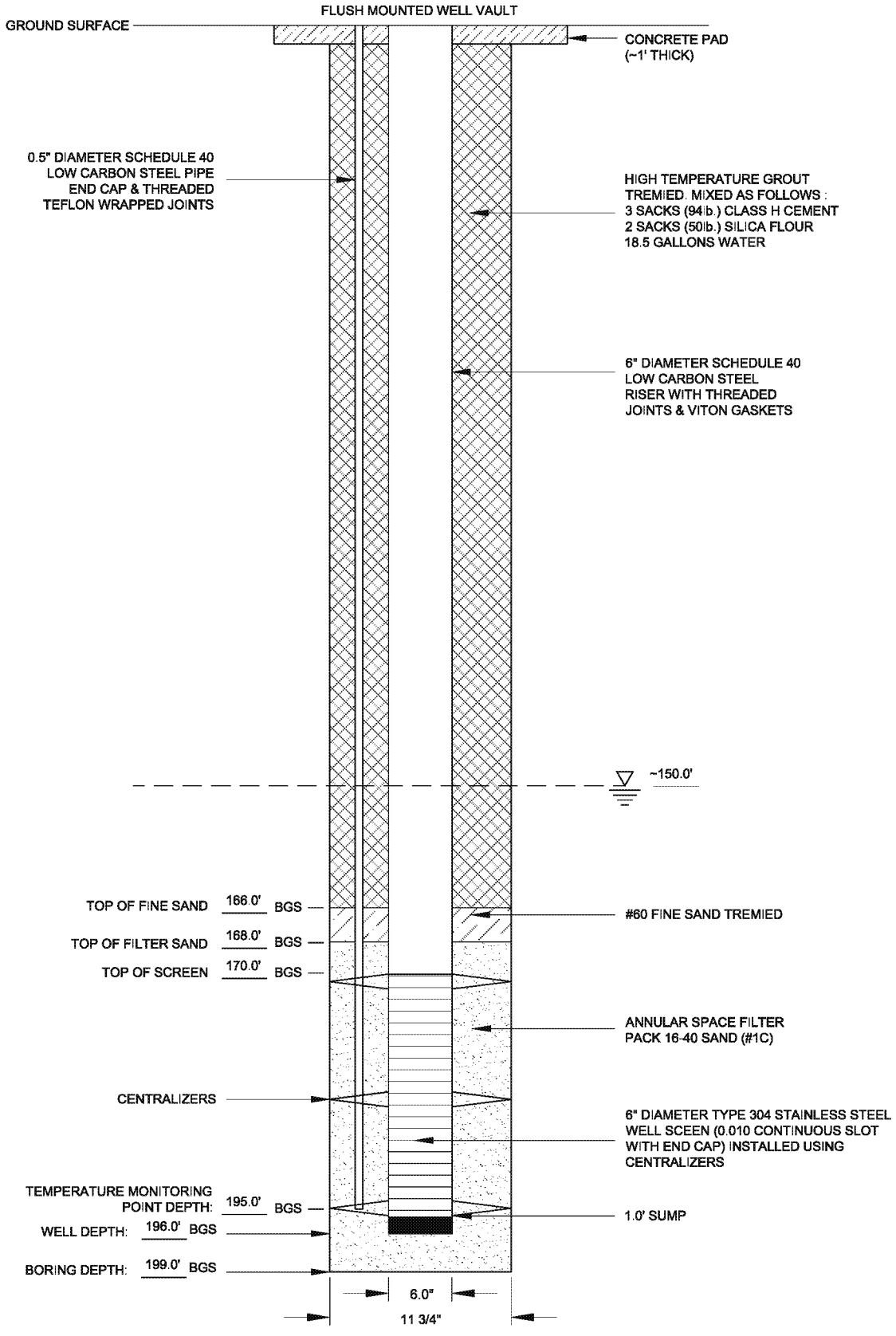

JOB NO.	9101110001
LOGGED BY:	Russell T.
DATE:	10-20-2013

WELL ID ST012-UWBZ10
ADWR WELL NO. 55-916062

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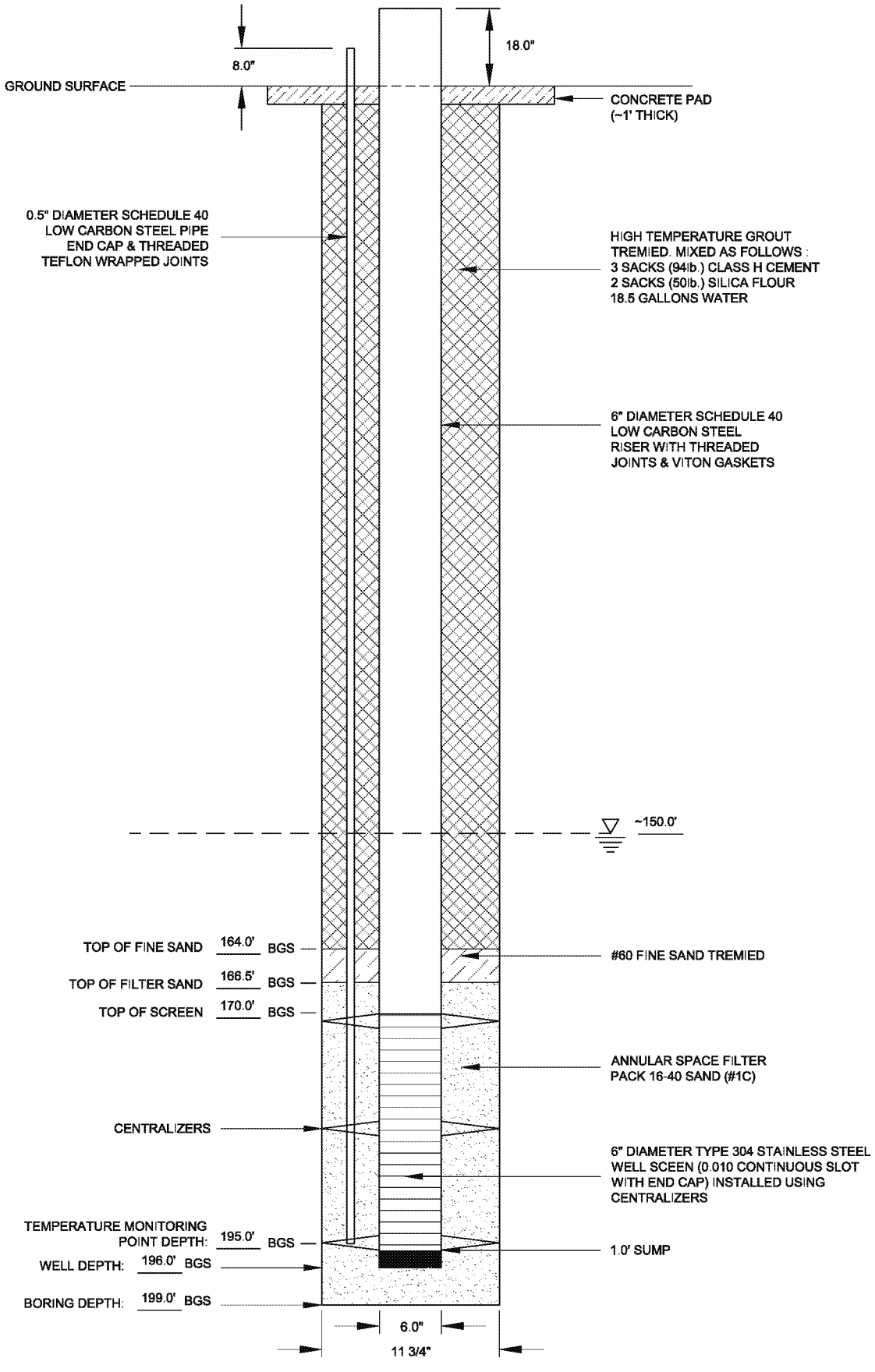

JOB NO.	9101110001
LOGGED BY:	Russell T.
DATE:	11-19-2013

WELL ID ST012-UWBZ22
ADWR WELL NO. 55-525774

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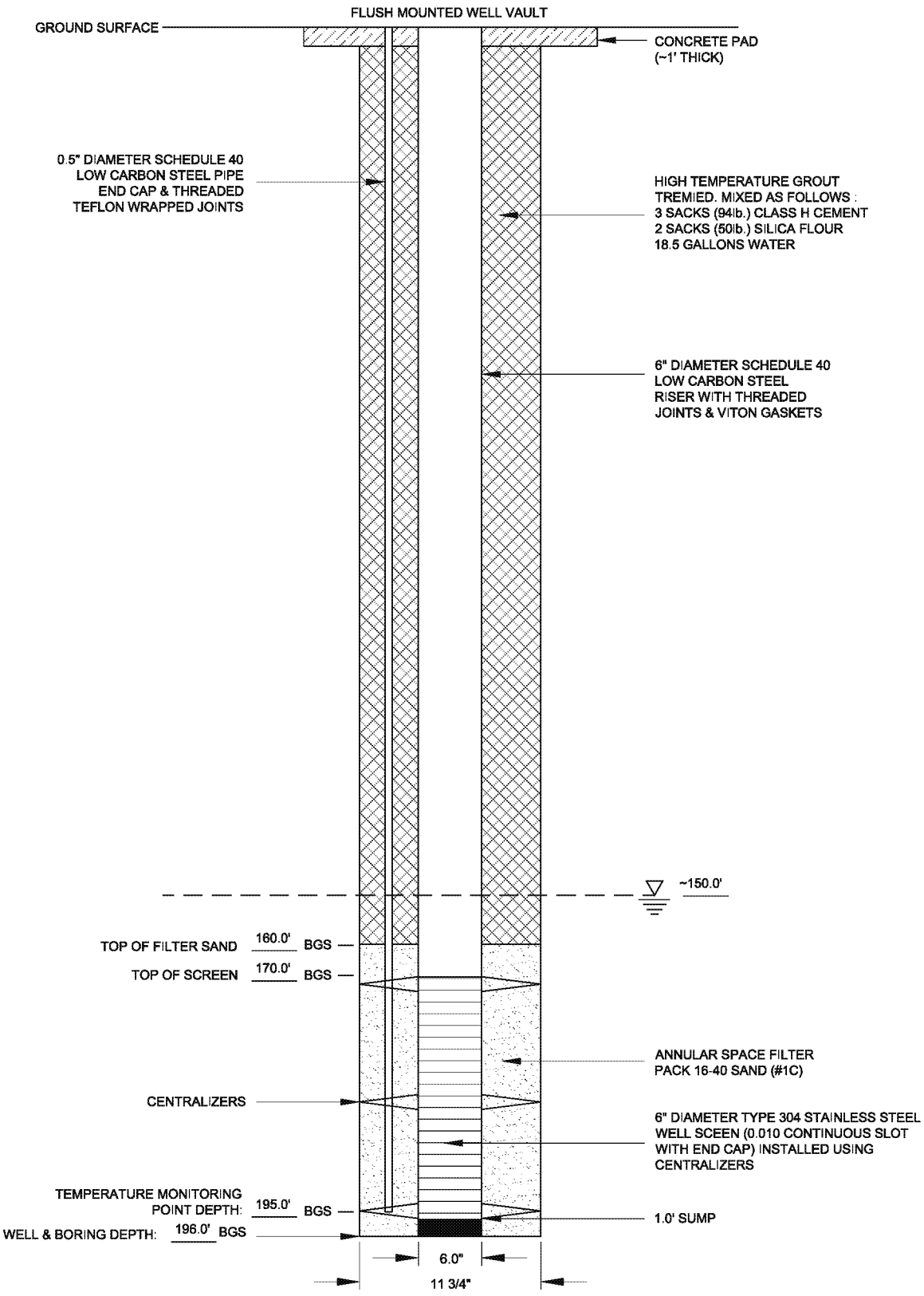

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	1-26-14

WELL ID ST012-UWBZ26
ADWR WELL NO. 55-916383

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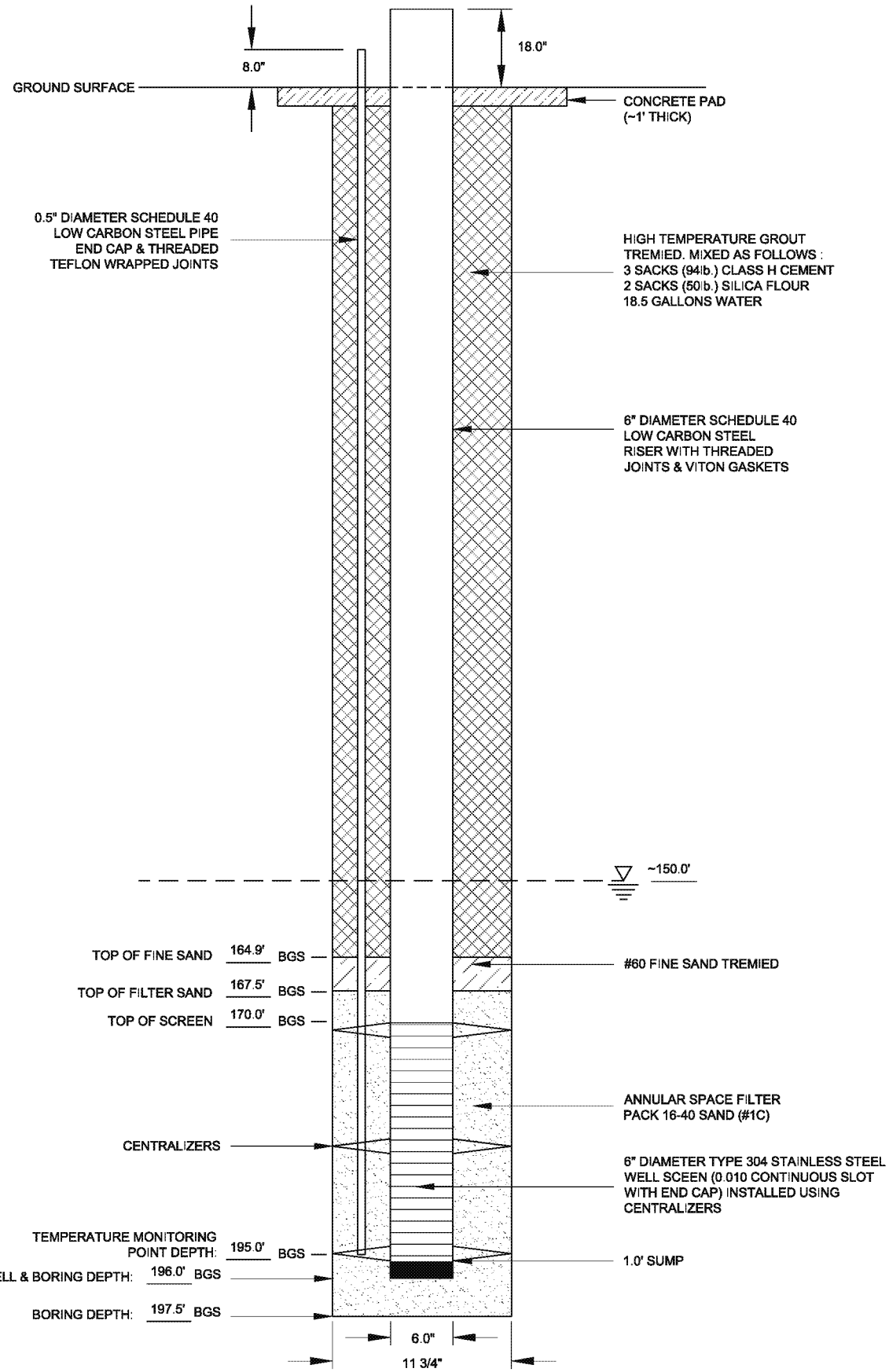

JOB NO.	9101110001
LOGGED BY:	Kyle K.
DATE:	1-21-14

WELL ID ST012-UWBZ27
ADWR WELL NO. 55-916384

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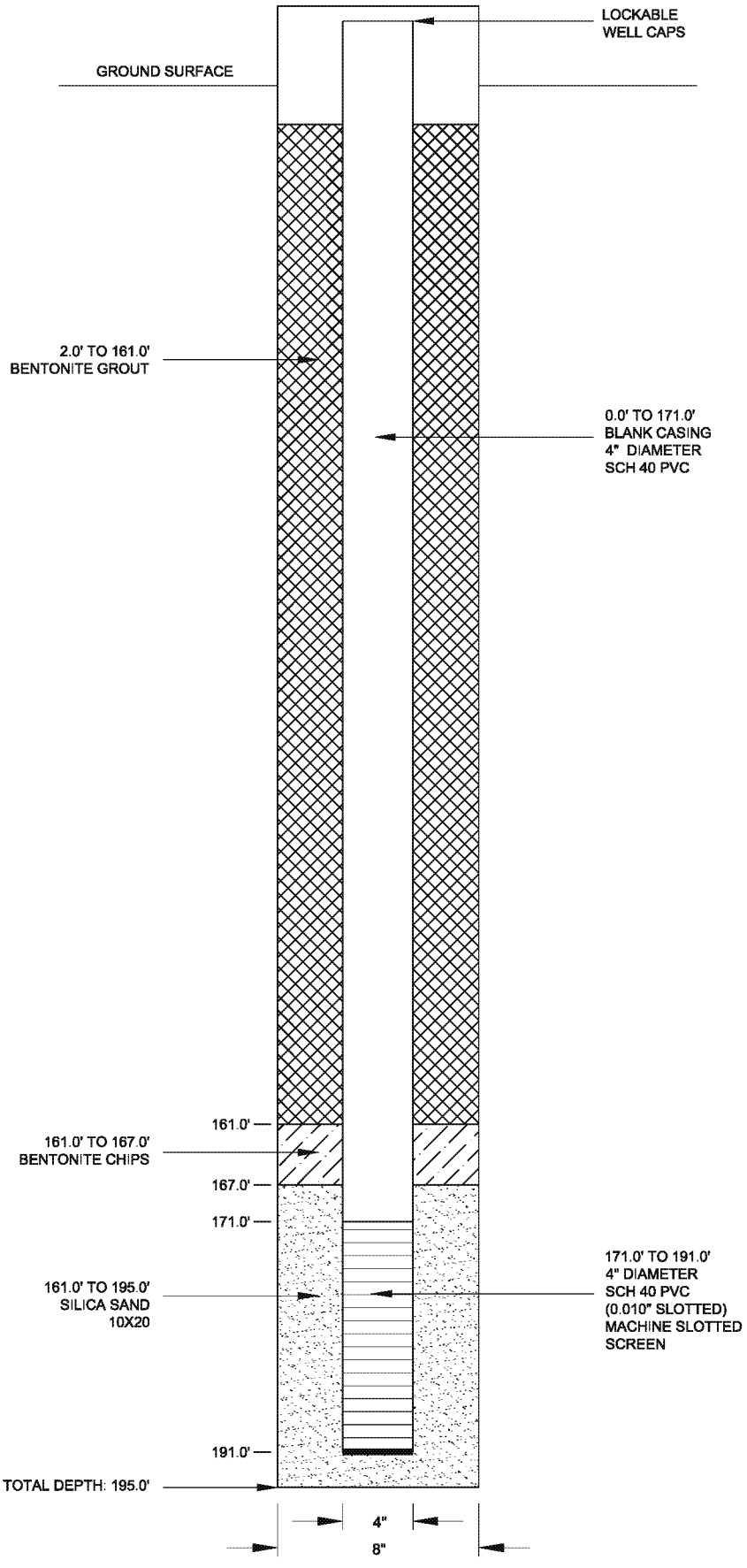

JOB NO.	9101110001
DESIGN:	GM
DRAWN:	GWH
DATE:	6/2016
SCALE:	NOT TO SCALE

MONITOR WELL UWBZ30

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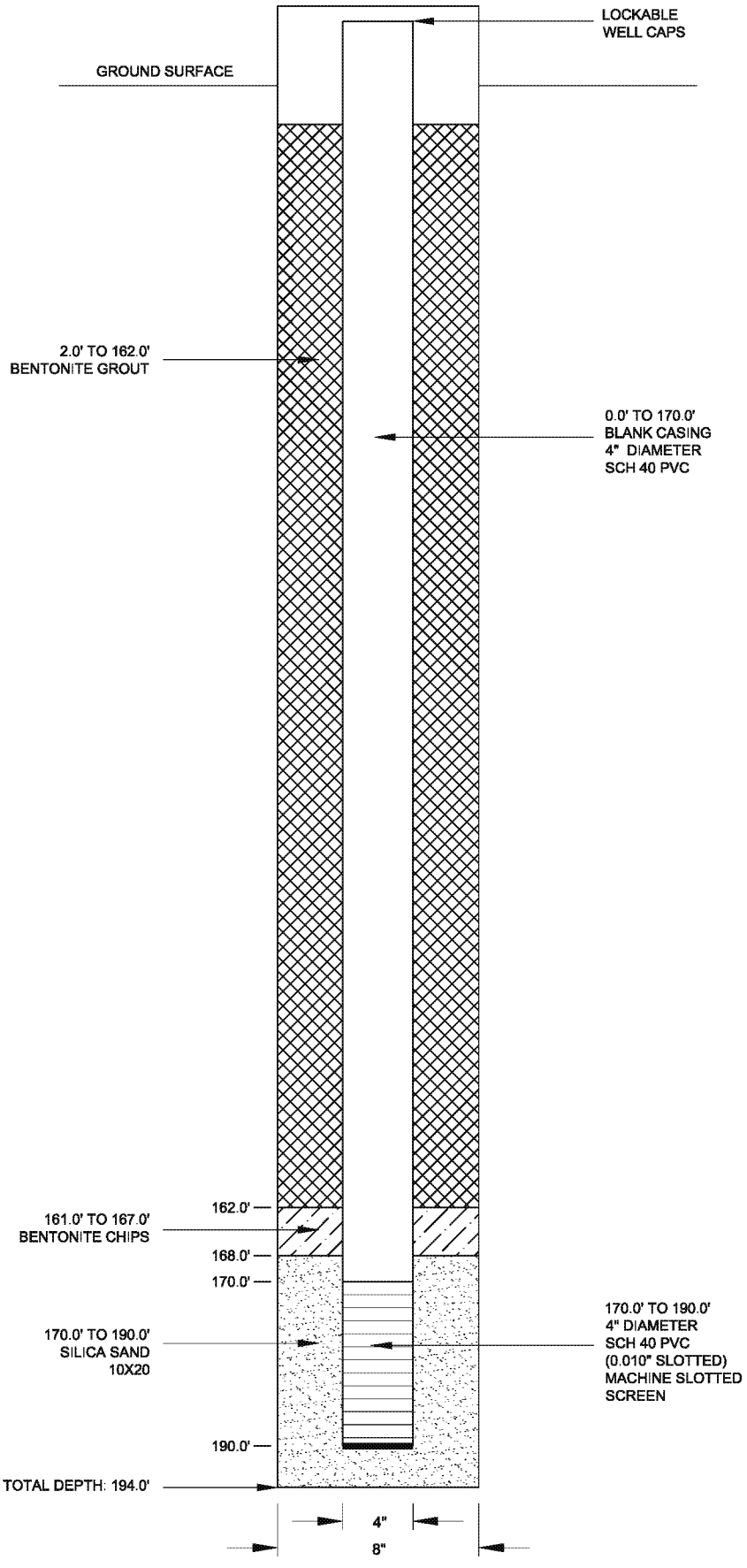

JOB NO.	9101110001
DESIGN:	GM
DRAWN:	GWH
DATE:	6/2016
SCALE:	NOT TO SCALE

MONITOR WELL UWBZ31

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